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THE LIFE AND WORK
OF
CHARLES PRITCHARD
*SAVILIAN PROFESSOR OF ASTRONOMY
IN THE UNIVERSITY OF OXFORD*



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THE LIFE AND WORK
OF
PROFESSOR PRITCHARD



John Ruskin, Esq.

From a photograph by R. W. Taylor, Oxford.

Yours very truly
L. Pritchards

CHARLES PRITCHARD

D.D.; F.R.S.; F.R.A.S.; F.R.A.E.

*Lucasian Professor of Astronomy in the
University of Oxford*

MEMOIRS OF HIS LIFE

COMPILED BY HIS DAUGHTER

ADA PRITCHARD

WITH

A LIST OF HIS THEOLOGICAL WORKS

BY THE RIGHT REVEREND

THE LORD BISHOP OF WORCESTER

AND

A LIST OF HIS ASTRONOMICAL WORKS

BY DR. EDWARD

FRYTHROFTON H. H. TURNER, F.R.A.S.

WITH A PORTRAIT

LONDON

SEELEY AND CO. LIMITED

25 GREAT RUSSELL STREET

1897



CHARLES PRITCHARD

D.D.; F.R.S.; F.R.A.S.; F.R.G.S.

*Late Savilian Professor of Astronomy in the
University of Oxford*

MEMOIRS OF HIS LIFE

COMPILED BY HIS DAUGHTER

ADA PRITCHARD

WITH

AN ACCOUNT OF HIS THEOLOGICAL WORK

BY THE RIGHT REVEREND

THE LORD BISHOP OF WORCESTER

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OF HIS ASTRONOMICAL WORK

BY HIS SUCCESSOR

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F. Leake's History Series

From a photograph by R. W. Lawton, Oxford

Yours very truly
L. Pritchards

PREFACE

I FEEL that the name of Charles Pritchard will itself be deemed sufficient justification for the publication of this book. A word, however, may fairly be said as to the manner in which the Memoirs came to be written.

Upon the death of my father, it was thought among those who had known him privately, and also within the wide circle of those whose work and enthusiasms had lain near to his own, who were indebted to him as their master, and who had trodden where he led and assisted in the realisation of his hopes, that some authentic record of his life and work should be made. It was his old friend, the pupil of the early days of the Clapham Grammar School, Sir George Grove, who urged me to undertake the work. In the summer of 1893, he wrote to me: 'I have suggested that we should propose a biography to you. In it many of us could have our say. What do you think of this?'

The proposal for a joint work was readily adopted, and through the kindness and generous assistance of many to whom the memory of Charles Pritchard was dear, a scheme gradually shaped itself, and resulted in the present volume.

If the method adopted has of necessity interfered somewhat with the chronological sequence of the chapters, it has this advantage, that each part of my father's many-sided life has been dealt with by the writer best qualified to form a just estimate of it.

The production of these Memoirs has been a labour of

love to all who have contributed, but I owe, none the less, deep thanks to the Bishop of Worcester, Professor H. H. Turner, Sir William Herschel, Mrs Ogier Ward, Miss Agnes Weld, and to those who have assisted me by contributing letters; to Mr E. J. Webb, for valuable literary aid; and lastly to my sister Rosalind, whose sympathy and encouraging help have aided me in my task.

ADA PRITCHARD.

September 1896.

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Memoirs of Charles Pritchard

CHAPTER I

REMINISCENCES OF HIS EARLY LIFE

By his Niece, E. Ogier Ward

I AM asked to contribute my personal recollections of my dear uncle to his proposed Memoirs, and I gladly do so, in the belief that there is no one now living who knows as much as I do of his early surroundings. Without some outline of these, it seems to me, no one can draw a fair portrait of a character so many sided, so full of startling contradictions, as his certainly was.

I own I feel a little 'hampered,' not by respect for the dead, for I have nothing to tell that need detract one iota from *that*, but by consideration for the living, lest any word of mine should give pain to those who knew and loved him in his later years only, when the pure gold had passed through the furnace and been well refined.

Captain Charles Pritchard, eldest son of my uncle's eldest son, Sir Charles Pritchard, has recently made some elaborate heraldic and genealogical researches, which point decidedly to the conclusion that my uncle belonged to a family of considerable standing and antiquity in the West of England.

The name of Pritchard is very variously spelt in old

documents, and it is suggested that from an original form Pickard, or Picard, signifying a native of Picardy, it has been corrupted to Pytchard or Prichard, and finally confused with the Welsh Ap Richard, anglicised as Pritchard. Miss Isabel Southall in her work, '*Memorials of the Prichards of Almeley*' (Birmingham, privately printed, 1893), mentions an existing tradition that a member of this family—whose arms are the same as my uncle's—once entertained the Black Prince, and that 'this coincides with a statement in *Hallam's Constitutional History*, that Picard, Lord Mayor of London, gave a banquet to Edward III. and his son.'

I do not imagine that the Savilian professor ever knew of the Welsh motto mentioned by Miss Southall as belonging to the Herefordshire Pritchards:—

'Heb Dduw heb ddim, a Duw a digon.'—
'Without God—without anything. With God—all.'

But, in view of my uncle's unwavering and fervent faith, I doubt not it would have interested him.

I firmly believe that a dash of Celtic blood accounted for some of my uncle's characteristics. A Pritchard married to a Lloyd were his parents. Shropshire, however, the county in which the family had been settled for three generations, and which they dearly loved, is as intensely English as any 'shire' in the heart of the country; and although it lies in the shadow of the Welsh hills, none of its natives would like to be called Welsh. *When* the title of 'Proud Salopians' was first bestowed upon them I know not, but when I first knew this favoured county they certainly deserved it! Their exclusiveness and hatred of innovation had caused them vehemently to oppose the original scheme of one of the great railway lines, which would have brought it through Shrews-

bury. I am not sure which line it was, but they had succeeded in diverting it, and were only just beginning to find out their mistake.

Then, again, politics ran extremely high. The Conservative party was naturally predominant, and they were intensely jubilant at having just returned twelve Conservative members for the county, with Mr Disraeli at their head. Yet, such was the pride of birth and race, that I well remember at the Hunt Ball, which took place just at the time of the General Election of 1841, that the cool and distant civility of the 'great ladies' to Mrs Disraeli was quite as noticeable as the fact that *her* diamonds outshone even the splendid Powys heirlooms.

If the beauty of one's native county is a reasonable source of pride, the Salopians were fully justified. Grandly fertile soil, splendid woodlands, a noble, swift-flowing river, beautiful parks and country houses, picturesque towns and churches, and a general air of prosperity form the picture my memory retains.

It is true such fertile soil has its drawbacks; hills look tamer when cultivated to their summits than when gorse and heather run riot over them; and coming from the open downs and commons of Surrey, I missed the freedom of walks and rides over short crisp turf. Still, Shropshire was so beautiful I did not wonder at the love all our family felt for it. Most of them had an absolute horror of the atmosphere, the crowds, and the dirt of London, Manchester, Birmingham and all large cities. Some of them were said to have fretted and pined themselves ill when obliged to live in London.

Unfortunately, proud contentment with one's own place and conditions of life is often a bar to progress, and the Shropshire of my young days was in some ways behind the rest of England, and content to be so. 'They make a religion of their field sports,' said indignantly to me a girl from

another county who had married into the family. And, certainly, these were a main object of attention and conversation, and art and science were nowhere compared to them! Next, I think, in the Salopian estimation, after field sports, came cookery, which occupied a vast deal of thought and care. Perhaps this was excusable with such excellent provisions to be done justice to: splendid and abundant game, fat-pastured meat, Severn salmon, and cream plentiful as milk in a poorer country. Still, it did sound excessive to be told that my grandfather once took a long coach journey to buy a dish of cranberries, because there happened to be none in Shrewsbury market when he had a fancy for them!

Temperance and total abstinence were not yet preached through the length and breadth of England, but near London. in good society, it had become *unusual* for gentlemen to take too much wine after dinner. In Shropshire it was yet common enough! Shropshire ale was famous; not at all the sharp, bitter drink now so much relished. It was sweet and 'humming,' much more malt in it, less hops, and terribly potent. But the native heads were 'hard,' and could stand an immense amount of it.

Another thing that surprised me among my mother's immediate relations was their love of frolic, almost buffoonery, in which grown men and women would indulge, carrying it out in the form of practical jokes.* In this life of jovial

* As an illustration, I may tell a true story of a trick played by two ladies—thoroughly ladylike women they were—and no one who knew of it thought the worse of them for it.

They were sisters—aunts of my mother—both remarkably handsome women. They each of them in turn had received and rejected the addresses of a squire who might have served Sheridan as a model for Bob Acres, and whose devotion to the fair sex in general had won for him the nickname of the 'Knight of S—c.' He would not take 'no' for an answer, and, on one occasion, followed these ladies up to London, whither they had taken my mother, a girl of sixteen, to whom he had offered the bribe of a gold watch and chain if she would induce one or other of her aunts (he did not care which!) to listen to his suit! After pestering them for some days with his attentions, he suddenly appeared with tickets for a front box

enjoyment, free, open-air sports and general self-indulgence were the elder members of my uncle's family brought up, and I think it is much to their credit to be able to say that they one and all showed energy and readiness in putting a shoulder to the wheel when the pinch of altered circumstances made itself felt.

As far as we can trace the annals, the founder of the family to which my uncle belonged was a prosperous and much-respected man, town clerk of Meole, a small town near Shrewsbury, about the beginning of the eighteenth century. He was the great-grandfather of Professor Pritchard. He must have been a contemporary, as he was certainly a relation, of a highly-gifted woman, Mrs Pritchard, the celebrated Shakespearian actress who preceded Mrs Siddons, and whose splendid talents and spotless private character have won for her a monument and a poetical epitaph in Poets' Corner in Westminster Abbey.

I have often thought it must have been the tradition of their relationship to this great actress and excellent woman which brought about the anomaly of a very strong love and admiration for the stage amongst many members of the Pritchard family, in spite of their Calvinistic principles and education.

My grandmother (the mother of Charles Pritchard) was a notable instance of this. She would take any trouble and endure any fatigue to see a good play well acted. While a young married woman, she was staying in her father-in-law's house at Meole, when a travelling company of players arrived, in such poor plight that, not being able to hire the

at a theatre, which he pressed upon them, saying he had intended to be their escort, but, to his great chagrin, was obliged to go down to Shropshire that very night. To get rid of him, they accepted the tickets; but, when the evening came, they all three dressed up in old bonnets and shawls and went to the pit (which was permissible then), and from thence enjoyed the joke of seeing the unfortunate knight enter his box, find it empty, and sit there alone all through the performance!

Shrewsbury theatre, they acted 'Macbeth' *in a barn*, and went round to the houses of the well-to-do inhabitants to solicit not only the purchase of tickets, but the loan of articles of furniture and even of dress! My grandmother lent her black satin dress to the actress who played Lady Macbeth, whose own name was—Mrs Siddons! and whose brother, named John Kemble, played Macbeth!

Years afterwards (in 1816), the famous actress was recalled to the stage to play her great part, by Royal command, before the newly-married pair, Princess Charlotte and Prince Leopold, and my grandmother stood for *four hours* at the door of the great London theatre, and had her clothes nearly torn off her back in the entrance crush. It was understood that Lady Macbeth was to wear the coronation robes of Mary of Modena, queen to James II., which had been preserved by some adherent of the Stuarts and sold by a needy descendant.

My grandmother used to describe the scene and Lady Macbeth's stately sweep of her train when, in uttering the line—

'Greater still, by the All hail, *hereafter*!'

she turned towards the Royal box, and made a *point* of the words by a majestic curtsey to the Princess, which brought down the house in thunders of applause. And then came the very natural comment: 'Only to think that I had lent her my black satin gown to play that part in a barn!' A most unwarrantable use, no doubt, for the actress to make of her 'words' and poor Mary of Modena's historically splendid robes (*see* Macaulay), must have been a shocking anachronism. But, 'I tell the tale as 'twas told to me!'

The Princess Charlotte died the next year (1817), and my grandmother in 1820, leaving her youngest son just twelve years old.

The second generation of 'Pritchards of Meole' were

equally prosperous, and one of them was an architect and engineer of no mean ability. He built the first iron bridge in England, over the Severn, in Coal Brook Dale. It has given the name of Ironbridge to the town which sprang up around it, and is still known as 'Pritchard's Bridge' among architects and engineers.

The second son of this generation was Professor Pritchard's grandfather. He established a flourishing business in Shrewsbury, and had a family of thirteen children, who all grew to mature, and some to extreme old age. On his retirement to a house at Meole, built for him by his architect brother, he handed over his house and business in Shrewsbury to his eldest and third sons. The third was William Pritchard, the professor's father, and he had four sons and two daughters. The eldest of the family was my mother, the youngest child was Charles, and as he was twelve years her junior, this brought me, her only child, more on a level with him as to age than might have otherwise been the case.

My grandfather, William Pritchard, has always been described to me as a man of remarkable talent, industry and integrity, but of a violent temper, and impatient of the least contradiction. Politics, as I have said, ran high among Salopians, and it unluckily happened that about 1801 there was a fierce election contest between two rival branches of the Hill family, which seems to have brought with it all the bitterness of a civil war. In this contest William Pritchard became a violent partisan, and most unfortunately in opposition to his brother-partner and all the rest of his family. Strange tales were still current when I was in Shrewsbury of the fury of the struggle, and of the unheard-of expenses of the rival candidates, both of whom were said to have impoverished their estates. 'Voters were brought even from the West Indies, and Shrewsbury was drowned in strong ale.'

To my grandfather the consequences were disastrous. He had alienated friends and made enemies to such an extent that the town was unbearable to him, and he migrated to London. From this time for twenty years his life was a continuous fight with difficulties, of which the consequences fell heavily on his children. For several years after leaving Shrewsbury, their greatest happiness seems to have been paying occasional long visits to their maternal grandfather's farm at Rowton,* near Shrewsbury, when all country delights were once more theirs, and they always spoke of it as of a Garden of Eden.

Their father had fixed his new abode at Brixton. There was much about him of which his descendants may well be proud. His second son, John, has left behind him a short family chronicle, from which I have drawn a good many facts and dates not within my own knowledge. He draws a portrait of his father at this time as of a man just and honourable in all his dealings, never descending to any tricks of trade, working on in the teeth of evil fortune, employing the best materials and paying the best wages. Who can doubt that his youngest child derived his wonderful health and vitality from a father who is described at forty years of age as walking daily to and from his work in London at *such a pace* that a young man who had rashly bet his companions that he would keep up with him was completely knocked up, and had to give in to his unconscious competitor.

Professor Pritchard was born at Brixton on February 28th, 1808,† but no one can now point out the house. Being the youngest child, he had never enjoyed, except in

* From this village Lord Beaconsfield's friend, Lord Rowton, takes his title.

† This is undoubtedly the right date. But it is remarkable that, like his contemporary, Cardinal Manning, Professor Pritchard was unable to say with certainty in what year he had been born.

brief holiday snatches, the blissful life of a Shropshire country boy. This may have been good for him in some ways, but it left him scarcely any pleasant recollections of his childhood. For field sports he never through life had time or opportunity, and I do not think he shared his brother's hatred of London, though no one more delighted in country air and scenery. Neither can he ever, except at Rowton, have known a lavish indulgence in 'good things,' and though he liked them keenly,* he never became a slave to the pleasures of the table. He fully shared, however, the family love of boisterous, rollicking fun, and used to indulge in it sometimes to a degree rather detrimental to dignity, but which was no doubt a safety valve for a brain that worked so much at high pressure.

I think he was too much taken up with science ever to take deep interest in politics. The greatest misfortune of his childhood was the death of his mother when he was only twelve years old. Her precociously clever youngest son fell, after her death, first under the rule of an aunt who was proud of his talents, and alternately petted and punished him. I am afraid he had the character of being a 'very naughty boy,' and cost his second sister many tears, but she (a very lovely girl) married at sixteen, and his aunt died early, and from that time his home life was unsoftened by womanly kindness till he left college. It is true he inherited his father's irritability, and could not have been easy to manage, but from anecdotes I have heard I suspect his naughtiness often consisted of troublesome pranks, which were punished just as much as moral offences. Of this kind of injustice I think there are traces of his recollection and resentment in his *Annals of Our School*

* He once wrote to ask me for a special recipe for mince pies, which he remembered eating at Rowton, in the Christmas holidays.

Life. In it he has given a graphic account of the way he was shifted about to four different schools. To one of these he never ceased to confess his obligations. It was a private, middle-class school, kept by a 'most worthy and indefatigable master,' one John Stock, of Poplar. Of his first private school at Uxbridge he gives no pleasant picture, but he adds:—

'There must have been some good about it' (the teaching), inasmuch as I am told that an elder brother of mine, at the age of sixteen, was frequently observed sitting apart in some solitary corner with his *Aristophanes* in his hand, and there convulsed with laughter.'

I felt some surprise when I first read this sentence in the *Annals*, for, in the first place, I am not inclined to attribute this striking familiarity with the language and perception of the humour of the old Greek drama to any Uxbridge teaching, but to this wonderful boy's own talent. In the second place, I could not understand how my Uncle Charles, so modest as he was about his own powers, had made so slight an allusion to his gifted 'elder brother.' But since I have been looking closely into dates and facts, I see clearly that he really knew very little of his brother George* (five years his senior), and may never have realised the fact that he himself was not considered in boyhood the cleverest of his very remarkable family. Such was the case, however. A gentleman who had been at this same Uxbridge seminary told my mother, at a time when 'the head of Clapham Grammar School' was becoming famous, that he had been a 'schoolfellow of both her brothers, George and Charles,' and that George was 'considered a far cleverer lad than Charles could ever grow to.' And my

* Indeed, this appears from his own words: 'I had no companion of my own age, nor, indeed, of any age, excepting my *two* brothers' by whom he meant William and John. George must have been sent to New Orleans before Charles went to Uxbridge, and he probably spent all his holidays at Rowton where he was a favourite.

mother and my Uncle John both declared to me in after years that this had always been the family verdict. The sequel of the short life of this promising scholar George was a sad one. An uncle on his mother's side, who was 'doing well in cotton' at New Orleans, made my grandfather an offer to take one of his sons off his hands. At the time the offer was made, the two eldest were just starting for themselves in business in London. Charles was too young (only eleven years old), so George was sent out, and very soon fell a victim to yellow fever, to the great grief of all who knew him, and who felt he had been sacrificed to pecuniary circumstances.

Things were now going from bad to worse. None of my uncles could ever speak without a shudder of the years at Brixton that followed my grandmother's death, when my grandfather's temper, exasperated by misfortune, ruled supreme over their young lives. But brighter days were at hand. A relative, struck with the business talents of the eldest son William, had helped him and John to establish themselves in London, and they partly undertook the care of Charles till he could, by some means, be sent to Cambridge.

In 1822, the eldest of the family, my mother, was married to John Allan, a retired surgeon of the Royal Navy, and my grandfather, thus set free from the charge of his children, soon after left Brixton and returned to Shrewsbury, where he married a lady with a nice little property at a neighbouring town (Middle), who gave the quaint reason for the match that she 'married Mr Pritchard out of her great regard for his first wife.' He survived his kind second wife some years, and died at Middle in 1859, aged ninety years.

His son John afterwards attained to the same great age. I have perhaps dwelt too long on my uncle's early disadvantages, but to me it seems unjust to conceal them from anyone who has to review his whole life and character.

The early loss of his mother, the subjection to an irascible father's moods, the absence of the refining influences of society, could not fail to be injurious to a passionate and timid child. And, accordingly, he grew up bristling at all points with asperities, which it took all the sunshine of success, all the chastening of heart sorrow, all the purifying work of religion gradually to smooth away in after years. And to those who knew him best in latest life it was evident that the smoothing process was going on to the very last.

My mother's marriage proved a turning point in her youngest brother's life. My father was a man of a high order of intellect, and keen to perceive and encourage it in others. He early discerned his young brother-in-law's great talents and unfitness for a life of business drudgery. As my uncle himself expressed it to me, 'Your dear father never ceased "dinning it, dinning it" into *my* father that I *must* go to Cambridge.' And, at last, other friends came forward with substantial help, and the promising, rather uncouth, lad went to St John's College, Cambridge, in the least expensive way—as a sizar.

Of his hard-won honours at college he has spoken modestly in the *Annals*. I will only bear witness that never were the grand intentions of the founders exercised in the case of a more grateful student. He never missed an opportunity of expressing his deep sense of them. With this period of his life my personal recollections of him commence. I distinctly remember his doings at Cambridge being discussed by my mother and my father, who followed every step of his progress with eager interest. Had I been as other children under ten years of age, relegated to a schoolroom among companions of my own age, I should not have heard so much, nor understood what I heard. But I was a solitary child with books for my bosom friends, and constantly in the company of my parents, especially of my father, who, with no wish to see

me precocious, could not help elevating my mind above my years. Thus it was, no doubt, that I can distinctly remember an anxiously - expected letter, and my mother's blank look and my father's tone of disappointment when he read,—‘Only *fourth*, not Senior Wrangler.’

Here I shall anticipate a little to give my uncle's graphic explanation of this, which we had from his own lips a little later. He painted for us a word-picture of a scene, well enough known in these days of examinations, but which at that time, and to us quiet dwellers fifteen miles from London, had all the charm and the awe of novelty. He told us of the first day of the ‘Tripos.’ He described the great ‘schools,’ the candidates each seated at his table, the spectators looking down from the gallery, the devouring anxiety when the papers were given out, the happy satisfaction or the blank despair with which each man viewed the work cut out for him, the various moods in which they set to work at once, or else sat staring at the task.

He himself was, all through life, of a most nervous temperament, and unable to concentrate his attention if anything happened to worry him. Unluckily, the man nearest him was gesticulative; rustled his papers, fidgeted in his seat, bit his pen, slapped his forehead, stamped his foot, all this probably without much noise, but with enough to excite my uncle's fastidious irritability. The result was that Pritchard's paper was given up almost blank the first day, or even two days, to the utter dismay of his tutor, who knew him to be quite capable of answering the whole of the questions. On the third day he made amends; a mathematical paper was set, of exceptional difficulty, the *crux* of the examination, which instantly called forth and absorbed all the powers of his mind. From that moment the hall, the spectators, his competitors, his own fears of failure, existed no longer for him. As his intellect rose

to grapple with the abstruse problem, he must have felt something akin to

‘The joy which warriors feel
In foemen worthy of their steel.’

He came out of the struggle successful and content. ‘That paper gave him his place,’ and he went through the rest of them with comparative ease. I believe there was no doubt among tutors and examiners that he would have come out first of his year if he could have ‘collected’ himself earlier. Anyhow, he took one of the Smith’s Prizes soon after, and then came down to us at Epsom to enjoy a rest.

How well I remember looking out for the coach, and seeing him come down from the outside, a spare, pale young man, with a rather narrow, but very high, forehead, abundant long black hair, which he often swept back like a mane, and those wonderful dark blue eyes which never needed spectacles after more than three score and ten years of microscope and telescope, and Greek type and mathematical symbol, and incessant writing and reading. I did not think him good-looking, rather the reverse, but he fascinated me, and the fascination never wore off, but endured through all the changes and chances of our respective lives. There was about him a sense of power, of the presence of something more than an ordinary man. The spell lay partly in his voice and manner of speaking, which was unlike anyone else. Except when raised in anger or command, the voice was low, and even a little thick. He had lisped when a child, and there was something left like a lisp in a peculiar movement of the lips that gave emphasis to some syllables. How can I describe that way of breathing out words, rather than speaking them, when he was very earnest, that so instantly riveted attention? It was

like a whisper, yet was not a whisper. I am not quite sure that a strict elocutionist would not deem it a defective mode of utterance. All I know is that it gave an impression of such sincerity, such *conviction* of the importance and truth of what he was saying, that none who heard could lightly disregard what was said. I have watched the effect of these undertones on guests at my father's table, on men who, for the most part, had made their own names known, and who had not, in the early days, heard of Charles Pritchard, who as yet knew him only as the brother-in-law of their host, and were not attracted by his rather shy, not very conciliatory manner. After a few sentences exchanged, there would be a look of surprise, then interest, and this would deepen into respect and admiration as the talk proceeded. It was no trick of diction, no effort to gain attention. Though conscious of great mental power, no man was ever more modest, or knew better his own limitations. He never talked, or lectured, or preached to show off his own learning. Overbearing and abrupt he might be in argument, but only because he was sincerely convinced of the truth himself, and could not bear to hear it disputed. If convinced of being in the wrong, he would own it unreservedly. Conceit was to him a thing intolerable. In fact, there was in him a certain timidity or diffidence of his own powers. He told me he had rather shrunk from a conference with sceptics of the working-class, whom he was asked to meet and address, 'because,' he said, 'I have no readiness.'

After entering on his career as a schoolmaster, he used often to run down to Epsom to talk over his difficulties, his quarrels with committees, his plans, etc., with my father, and then would grow enthusiastic over education and science. I (a mere child) was supposed to be absorbed in my favourite books, but I used to listen entranced and watch my dear father's face, sometimes grave and cautioning, sometimes

approving, and often lighting up with delight when some new development in science was unfolded to him. My mother, though as intelligent as the rest of her family, was a bad listener, being too intent (like a true Salopian) on 'matters of the house,' but she used to pass in and out, well pleased to see the two conversing on high themes.

As time went on we saw less of him, and my father died, and I really believe no one felt his death more deeply than my uncle. Then there were sorrows and changes in his own home circle, and then again a sort of renewal of his youth, and a time of retirement to enjoy life again and rest in the Isle of Wight. How he was called back to university life and astronomical research he has himself told us. He really lived the lives and earned the fame of two or three ordinary men. Let others more competent speak of him as a schoolmaster, a theologian, a man of science, an astronomer. I only wish to bear my small tribute to his extraordinary powers as a *preacher*, and to express the regret I often felt that he had no larger and more permanent opportunity of making them felt. At one time we thought this would have been the case. He was encouraged, when still very young, to stand as a candidate for the Preachership at the Magdalen Chapel, then a fashionable resort of 'the religious world' on Sunday, and famed for its eloquent preachers. My father and I drove up from Epsom to hear his trial sermon. I remember it dimly as being exquisitely pathetic. We were told afterwards that he very nearly got the appointment, but interest among the governors prevailed in favour of another candidate.

He preached a good deal, about this time, in various pulpits in Stockwell and Clapham. He prepared his sermons with as much intense application as he had ever employed for his university studies, sitting up half the night after his school work, and drinking *green tea*! What would the

doctors of the present day say to such a regimen for an excessively nervous man? He would not put less work or less earnestness into the message he had to give from God, than he put into his secular teaching; and the result was a tone of sincerity that carried all before it at a time when popular preachers were much given to a bland plausibility. It was rather the fashion with them to preach in lavender-coloured gloves, and I once heard him say,—‘It is inconceivable to me how a man *can* preach in gloves!’ This quality of sincerity must have been very strongly marked to induce his second sister, whose tears his boyish ‘naughtiness’ had caused to flow, and who knew better than anyone else all his failings and infirmities of temper as a young man, to follow him about from church to church, only to hear him preach!

I myself can never forget some of those early sermons, although I cannot trust my memory to quote from them. He was not *eloquent*, his voice did not suit a large building well, but his choice of language was exquisite, his power of arresting attention most remarkable, and his tenderness and pathos irresistible because so thoroughly unaffected. I have heard many fine preachers, but none so *impressive*.

In daily life his moods were capricious; sometimes full of deep solemnity, sometimes indulging like a boy in boisterous fun, sometimes irritable and nervous to an extraordinary degree. The horror of affectation, of appearing to *pose*, would often lead him, after uttering some beautiful and touching sentiment, to turn it off with a jest, as if deprecating his own sincerity and emotion—a habit very discomposing and perplexing to listeners.

But in the pulpit all these inconsistencies and eccentricities were swept away and forgotten in the awful and intense earnestness with which he set himself to deliver his divine message to his fellow human beings. He was transfigured for the time, and greatly dignified, and I could

wish he had been more frequently known and seen in that aspect.

One sentence from one sermon I shall venture to quote. I heard him preach it in Clapham School Chapel soon after a deep family affliction. The subject was the story of Lazarus. He came to the Saviour's words to Martha:—‘Thy brother shall rise again,’ and her answer, ‘Yea, Lord, I know that he shall rise again at the last day’; and he paraphrased it:—‘Yea, Lord, I *know* that he shall rise again—at the last day—it is no fear, no doubt of that! Oh, Lord, it is not *that*—*not that*, which makes my heart so desolate!’

How cold the words look now they are written! To *hear* them was like listening to a stanza of ‘In Memoriam’ recited by a master of tone-music, and it seemed quite natural to me in later years that the preacher who so uttered them had become a close friend of the poet, when neighbourhood brought them together.

As soon as his position was assured by his success at Cambridge and consequent appointment as headmaster of the Stockwell Grammar School,* my uncle began, naturally,

* At this particular time, what were called ‘Grammar Schools’ were being opened in many localities on rather [a novel plan, and there was a general stir in the public mind on the subject of education.

Charles Pritchard was the first headmaster of the Stockwell School, and at its opening he delivered an address which made a deep impression, and for many years he used to speak of it as ‘the best thing he had ever done.’

It was a very earnest exposition of his theories of education—theories then novel and rather startling, but which, for the most part, have been adopted since then. It showed him in the character of a pioneer. In one respect, I think few of his followers can have attained to the same pinnacle of success that he did in inspiring schoolboys with a sense of honour.

The first time my husband went with me to Clapham, an apple tree, loaded with ripe fruit, was hanging over the private garden wall into the playground, and my husband remarking upon this with surprise, my uncle stopped in his walk, and said in that deep, soft, emphatic voice of his,—

‘I should be sorry, indeed, to think that *one* of my boys would touch *one* of those apples!’

And it was quite clear that not one of them had done so!

to long for what is, and ought to be, the ambition of every right-minded young man—a home with a wife in it—and he had not far to seek.

With his reputation for remarkable talent as a teacher, preacher and lecturer, he could not but be attractive to the minds and hearts of the female part of his acquaintances. It is true that he was not handsome, but his appearance was *impressive*, and his shyness and want of society manners were in his favour, as they were set down to his absorption in thoughts of higher things. Besides this, he was extremely fascinating, and it was not easy to resist the persuasive tones of his soft, earnest voice. We, therefore, watching every step of his progress from only a little distance (at Epsom), were not surprised to hear that he had won the heart of a young and beautiful girl. I well remember Emily Newton's first visit to Epsom, and how we were charmed with her. My dear father especially formed an affection for her that never wavered during the rest of his life, and she returned it warmly. To me she was ever a kind and sincere friend.

I myself do not remember the exact date of the marriage, but am told it was in the year 1836. As he had, of course, to give up his Fellowship, some care was required at first to manage a small income, and at the same time to keep up a liberal style of housekeeping for the private pupils whom he at first received in his own house. And it must be said, in simple justice, that his young wife made an admirable mistress to their small establishment. She had learned the art of housekeeping well at her father's house before she married, though the education she received at a fashionable Clapham school was superficial and shallow to a degree that would not now be believed, and did no justice to her really considerable powers of mind. As a hostess she was admirable, and when the success of the Clapham School rapidly expanded, she rose to the level

of her husband's improved position, and 'did the honours' for him splendidly.

This was the bright side! There was a reverse, of which I need not say much. My uncle was at that time not an easy man to live with. His superabundant energy made him restless under the combined cares and inevitable anxieties of school and family, and his natural irritability of temper broke out only too often. To spare him as much as possible, his children were being constantly sent away to the country homes he was now able to provide for them—at Ramsgate, at the Lakes, and elsewhere.

The Clapham life was one of continual excitement and turmoil, wonderfully successful, but fitted neither for him nor for his wife, who, unfortunately, was as nervous and excitable as himself.

As a small and trifling instance of the kind of thing which was continually happening, I remember going over one day from Kensington after my marriage, and finding the whole establishment, from the headmaster down to the kitchenmaid, in a commotion over—coffee-pots.

He was never satisfied with anything short of perfection. Some complaint had been made of the coffee, and the whole school had more than once been kept waiting breakfast while some new form of coffee-pot or 'biggin' was tried. Some made the coffee thick, others were too slow, and one sort after another was discarded. Matron and cook were in tears, masters were surly and uncomfortable, my uncle was furious, and my aunt wild with worry.

As soon as I appeared I was pounced upon to explain how the coffee used to be made at Epsom, where it was always good.

I said, 'In a flannel bag, but that I believed *felt* bags were to be bought, which answered as well.'

'Ah, yes, *felt* was the right material;' and instantly I

know not how many felt bags were ordered, nor do I know whether they were successful.

Never a strong woman, my aunt died at little more than middle age, leaving her children at the most critical time of their lives, just growing out of boyhood and girlhood.

No bereaved husband and father ever mourned more sincerely for the loss of his wife, or ever tried more conscientiously to do his duty to his motherless children. His eldest son soon after entered the Civil Service of India, and his distinguished services and the very eminent position to which he has attained have proved him to be his father's intellectual heir. He is now Sir Charles Pritchard, C.S.I., K.C.I.E., and so distinguished a man that to be his father is in itself no ordinary distinction, and it becomes a matter of unusual interest when not only the talents, but many characteristics of the father have been so clearly reproduced in the son.

The *Times of India*, of 29th February 1896, says :—

‘Sir Charles Pritchard left India on Saturday last after a service of something over eight-and-thirty years. He carries with him the hearty good wishes of all who know him. . . .

‘Sir Charles arrived in India before the last echoes of the Mutiny had entirely died away. His first work was to free Belgaum from bands of robbers. . . .

‘Two years later his name became still more widely known in connection with his exposure of the great Public Works Fraud. About this time the Salt Department was ripe for his energies, and in five years, with so much vigour had he taken it up, that the revenue went up from 68 to 104 lacs. His fame as an organiser spread abroad, and in 1876 he was appointed President of the Madras Salt Commission. . . .

‘All this was preparatory to the great work of his official

career. He devised a scheme which aimed at the high ideal of diminishing drunkenness, while at the same time increasing the revenue, and he carried it through with the *unflagging energy and masterfulness* which were the distinguishing characteristics of his career. Whatever may be the final verdict on the scheme, it was worked out with a courage and ability which compel admiration and cordial acknowledgment. . . .

‘In 1887 Sir Charles Pritchard became Commissioner in Sind, where he devoted his extraordinary energies to harbour works, irrigation, railway extension, the establishment of women’s hospitals, training schools for nurses, etc. . . .

‘In 1889 he was appointed member of Council, and towards the end of 1892 he took his place as Public Works Minister of the Viceroy’s Council.’

The article ends, after some details of his ‘masterfulness’ in putting down the smuggling in salt, with these words:—
‘A singularly able and gifted administrator in all he undertook, Sir Charles Pritchard made many friends, who view his departure with regret, and wish him a very happy time on his well-earned retirement.’

My uncle remained a widower for several years. Very soon after his second marriage, which took place in 1859 to Miss Rosalind Campbell, my children’s health induced us to remove from the neighbourhood of London into the country, so that I saw comparatively little of his second wife. But I saw enough to convince me more than ever of the wonderful fascination he could exert when he pleased and wished to win. For it could have been no common attraction that could induce a sweetly charming and high-born young woman, with a handsome fortune and great good sense, to marry a man of fifty years of age with a family nearly grown up.

I saw enough, too, to convince me that it was a marriage of sincere affection on both sides.

I believe his wife soon saw that the Clapham life was too trying and exciting for my uncle's nervous temperament, and that it was in deference to her judicious wish that he retired to the Isle of Wight. I am quite sure it was the real rest he found there (when really and for the first time living a quiet domestic life) that enabled him to make a fresh departure as an astronomer at Oxford, to the amazement and admiration of his contemporaries.*

Of Freshwater and Oxford his younger children have written in a way that leaves no doubt as to the happy influences that guided the latter half of his life. Even the last crowning grief of their mother's almost sudden death, in 1891, seems, from their accounts, to have had none but a softening effect upon him, ripening his heart and spirit for the last great change.

And here my task is ended. May it appear to others less imperfectly accomplished than it does to the writer.

* I cannot refrain from adding my tribute to my Aunt Rosalind's memory. She was an *ideal* helpmate for a highly gifted and highly irritable man. Had it been the good fortune of Mozart or Molière to meet with such a wife, they might not, perchance, have died in their prime, and the world might have been the richer by many a masterpiece.

CHAPTER II

HIS WORK AS A SCHOOLMASTER, 1833-1862,

By himself

[Of my father's career as a schoolmaster, the best account has been given by himself. When, in 1886, the gold medal of the Royal Astronomical Society was conferred upon him, a large number of his former Clapham pupils celebrated the event by entertaining their old schoolmaster at a dinner, which took place in London on the 5th of July, and of which fuller mention will be made in its proper place. It was to this company of 'Old Boys' that my father soon afterwards addressed the autobiographical pamphlet entitled, *Annals of Our School Life*, the bulk of which is contained in the succeeding chapter.—A. P.]

MY own school education was not fortunate. Sixty years ago, and before Dean Stanley's interesting portraiture of Rugby life, public schools were in general, and in many respects, incredibly inferior to their present condition; on the other hand, private establishments, or, as they are often ignominiously but unreasonably designated, private adventures, were at that day intrinsically pretty much the same as they are now. Not resting on endowment and ancient establishment, they were within easy reach of the effects of opinion. I cannot judge accurately and in all respects of my own first school, but the little that I do remember was not pleasant; this recollection, however, touches only on the internal and economical arrangements. For there must have been something substantially good about it, inasmuch as I am told that an elder brother of mine at the same school, at the age of sixteen, was frequently observed sitting apart

in some solitary corner with his *Aristophanes* in his hand, and there convulsed in laughter.* Our great public schools can produce nothing better in that line at the present day. I was myself far too young to emulate or appreciate any such accomplishment, but I was quite old enough to be conscious of other discipline and severe deprivation. Whether it was in consequence of the dietetic hygiene of Abernethy, or whether it came from the observation of the lower animals, I remember to this day that we were never allowed to drink until we had finished the solid parts of our respective meals. Worse than that, no drinking was permitted between the meals, not even in respect of fluids non-alcoholic. The consequences of this arbitrary regulation were natural and unsalutary. In the first place, we resorted to an old and half fetid rain-water barrel; and in the second, we contrived to haul up bottles of water, procured out of the town, into our bedrooms, at the hazard of a consequent flagellation. If the mention of such trivial matters as these excites your surprise, I pray you to call to mind the happier condition of the old Clapham school life; and, if the contrast is evident, then I would have you believe that it, and many other regulations, owed their origin to the recollection of my own boyish sufferings, and of many other illiberalities of which I was the conscious subject. As another instance of this contrast and of its origin, I may recall to mind the institution of the Clapham swimming bath, from which so many of yourselves derived advantages still probably in activity. I have no doubt that the suggestion of this device originated in some unpleasant reminiscences of mine in relation to the River Colne at Uxbridge. The one-armed gentleman who presided over our establishment was wont to attach a rope to one of our arms, and then project us into ten feet of water by the side of some floodgates on that stream. The effect of this regulation, owing probably to a certain stubbornness of

*See p. 10.

disposition, and a too sensitive appreciation of justice, was exhibited in my case, in that I have never learnt to swim. On the other hand, when my own turn came, I established the gentler amenities of the bath at Clapham, with the result that in due time the 'Old Boys' of those days could all swim.

From my Uxbridge school I was removed, at about the age of twelve years, to Merchant Taylors'. Here again I was fated to be unfortunate. The aged preceptor of my own form was possessed by an evil spirit of somnolence, which it seemed impossible to exorcise. He would habitually fall asleep with a cane in his hands, or into a state of half-unconscious doze, during lessons; from time to time he would suddenly wake up, and the consequence was that a sharp instantaneous crack was heard, proceeding from the collision of the dread instrument with some luckless hand. If I failed to make much progress in the studies of the place thus administered, I fear I did attain to considerable proficiency in the art of truant-playing, one effect of which was that I gained an intimate acquaintance with the precincts and topography of the Tower of London, my favourite haunt on such occasions. Detection naturally followed, and ought I to regret to say that the kind-hearted headmaster of that day, instead of flogging me as I deserved, took the wiser course and removed me into a higher form? I wonder whether good Mr Bellamy discerned in the erring boy traces of powers which might come to a happier development in later years?

If the class discipline thus described was unsalutary, very different but much severer was another discipline to me in another respect. In those hardy days the school-work in Suffolk Lane commenced at seven in the morning. My habitation was nearly four miles distant, at Brixton. For a year and a half, or more, it was my fate to amble rather than to walk to school through those weary miles, regardless of rain or fog.

I do not remember that I ever complained of this severe arrangement: I was old enough to be aware that temporary

economical necessities were the cause, and I can never forget that the words most frequently heard in my home were 'Education,' 'Education'; so I suppose I felt that I was being 'educated.'

In due time, 1822, I was removed from these untoward influences to an admirable private school in the suburbs of London. My new Orbilius was a man who, contradistinguished from my former mentor, slept but little, and never in school-time.

He was a self-educated, energetic, practical man of very considerable abilities. He possessed largely the art of inspiring his pupils with the spirit of ambitious competition. The best arithmetician, the best writer, the best reader of the week, were all duly chronicled in our hebdomadal registers; and as I had within my own family been strongly imbued with the spirit of Achilles, αἰὲν ἀριστεύειν, I in due course became an adept in all sorts of arithmetical calculus, and I acquired 'the art of reading, writing, and speaking, with propriety.' Our chief read to us weekly some well-selected piece of English literature, and we weekly learnt some thirty lines out of Enfield's *Speaker*. Now, supposing this practice were continued even for two years of forty weeks, the accumulated result would be nearly 2500 lines of poetry, passing through, and dwelling for a sensible time at least, in our minds. Some of these excerpts from the poets I still retain, to my great refreshment. The elder Struve, the greatest of Russian astronomers, records that he was once stricken with a malady, in the course of which there recurred to his memory much of the literature which in various languages he had learned in his early youth, but had subsequently wholly forgotten. I am told that such maladies are by no means unknown at the present day: if so, some of us may have been visited with, so far, a not unpleasant surprise. Apart from this, the practice, even to a much larger extent, is assuredly salutary. Who of us, for instance, can ever

forget the lines of occasionally poetic wisdom grotesquely expressed in the syntax of the old Eton Latin Grammar? Boys under modern education, I fear, in general miss this pleasant advantage. We were, at this stirring school, indulged also with the sight of a fine collection of working models of such machinery as then existed, made and used by the celebrated Ferguson, a name well known to all English astronomers. The collection included telescopes and quadrants, and suchlike instruments of antiquated build. The mere sight of such implements is in itself an invaluable incitement to the curiosity of youth, and (as in my own case) probably has formed the turning-point of intellectual proclivities. I remembered all this when, about some twenty years ago, I introduced a watering-engine into my garden in a secluded parish of the Isle of Wight. Up to that day few of the inhabitants had seen any form of machinery beyond a spade or a plough. There have been, and I fear there still are, forms of education where the intellectual environments are bounded by what can be seen outside a tramcar, moving within a very contracted area. Beyond all, our active schoolmaster insisted on our acquiring the use of scales and compasses and the art of geometrical drawing; the delineation of maps and of architectural plans was also practised.

Very many of us could use the theodolite, and could survey and plot an estate. Our practice ground was mainly in the Isle of Dogs, at that time an all but unoccupied waste, and I well remember how, at the age of less than sixteen, I earned two guineas for indoctrinating an intending colonist in the art of field-surveying. I did not leave him until we had completed the plan of Kennington Common, and had calculated its acreage. Besides this, several of us contrived to hobble through the *Ædipus Tyrannus* and other suchlike forms of youthful and thorny jungle.

Now, I contend that this mode of education is pre-eminently valuable, and its results adhere to the mind as long

as the mind retains its activities. Our great public schools will one day learn to appreciate the value thereof. Something of this sort formed one of the many elements in the scheme of education which I devised for yourselves at Clapham: with this generic and important difference, that I had enjoyed the inestimable advantage of a classical and Cambridge education—a boon denied to my most worthy and indefatigable master. On the occasion of our recent gathering, one of yourselves, a man than whom none is more widely known or more highly respected in the city of London, pulled out of his pocket an exquisitely arranged chart of contemporaneous ancient history: ‘There,’ said he, ‘there is what you taught me to do, and do it from memory full fifty years ago.’ I was also told, on authority not to be questioned, that the first germ of what ultimately was developed into that nobly useful *Palestine Exploration*, was infused into the prolific mind of my dear old pupil, Sir G. Grove, by some of our Saturday’s imaginary travels from Clapham through Palestine, illustrated by chalk-drawn maps on the blackboard.* But that germ was in reality previously sown in my own mind at Poplar. It was there also that I first saw a retort and an air-pump, and an electrical machine, used unskilfully enough, no doubt, but used sincerely. A spark was thereby struck, which has been fanned into abiding light and warmth in my own mind, and subsequently in many others.

I wish I could also trace the origin of a higher moral form of teaching, to the abiding impression of these my early schooldays. I have often thought I could, at least by way of antithesis. Many of yourselves—and I wish I might with sincerity include the thought of all of you—many of you can remember what occurred to your minds during the time set apart at Clapham to preparation for Confirmation. My

* Cp. p. 72.

own Confirmation (alas! it was only in conformity to the general type of that day) was to me solely a matter of ceremonious form, to be gone through as a thing of course—age and the time of life alone being, for the most part the sole antecedents considered as necessary for the rite. I well remember that in the naughtiness of my heart I did not exhibit even the ordinary reverence due to a decent rite. My punishment was grotesque, but it was well intended; I was not allowed to descend to the bottom of the East India Docks in a diving-bell!—a scientific privilege reserved for those who were better behaved than myself. The rebuke was well intended, but in my case it partly missed its aim; for, inasmuch as our mentor had previously explained that the denizens of a diving-bell are usually beset by a notable singing in the ears, it occurred to me that after all I was better off out of the bell than in it. During the last half century, much has elapsed tending to elevate the moral being of the Englishmen of your generation. Peace and honour be to the memory of my old schoolmaster, John Stock, of Poplar, who did for me and for all of us 'what he could'—and he did very much of it well.

My next removal was to a school again antithetical to this last, but as I am not conscious that any impressions were left on my intellectual or moral being which have in any way borne fruit among my own pupils, I may dismiss the record of it in few words. The headmaster of Christ's Hospital was at that time (I am speaking of years ago) permitted to take a limited number of private pupils, who were placed in the classes under his own care at that most benevolent and famous institution. For perhaps a twelvemonth I was seated at the head of the Deputy Grecians. I remember learning my classical work with great diligence; but the lessons themselves I was rarely called on to 'say': no doubt some benefit was derived from

the performances of other boys, many of whom were gifted with much ability. But here, again, I was involuntarily enrolled among the peripatetics, and my fate was to learn by rote a goodly number (some forty) lines from Thomson's *Seasons* or from Homer, during a walk from St George's Church, Southwark, over London Bridge to the Newgate Street School. Perhaps a habit of abstraction was thereby engendered; for, very many years after, I have found myself enjoying the poetry in Monge's *Curved Surfaces*, or Lagrange's *Mécanique Analytique* in Exeter Hall, while the harmonies of the 'Messiah' or the 'Elijah' were floating sympathetically around me. Who shall say which was the truer music of the two—that of Handel, or of the French analysts? and was the habit acquired among the crowds on London Bridge?

The next two years* were to me probably less satisfactory than most others in my life, and as I am not conscious of much appreciable results from them on the proceedings of our school life, they need not occupy much space in this narrative. But even here is some exception. Economical reasons, arising from the unfructiferous outcomes of a manufacture of extreme difficulty, conscientiously but unsuccessfully persevered in by my father, put a stop even to the modest expenditure necessary for my schooling at Christ's Hospital. The natural and imperative question ensued, as to what to do with a lad between sixteen and seventeen years of age, presumed to possess scholastic knowledge, tastes and abilities beyond the average? Fortunately the advice and interference of an elder brother, endowed with an indomitable appreciation of intellectual habits, prevailed, and it was agreed on that I should be left to my own devices for study as best I could, and, as best I could, prepare myself for an university life, under

* 1824-1826.

the hope that from some quarter or another the means of realising the project would come to hand. Progress in purely classical studies for a boy left to his own resources seemed to be beyond my hopes. If, in 1825, there had existed one-fiftieth part of those aids and advantages which are within the reach of aspiring boys at the present day, then my course would have been comparatively plain: but open scholarships and exhibitions at either university were then as much the exception as they are now the rule, and I was not 'in the running' for such restricted competitions as then existed. So I was left to my own resources, and happily a genuine love of knowledge of any and every sort stirred within my intellectual frame; and inasmuch as the most attainable form of knowledge for the untutored was, and still is, mathematics, so to mathematics I betook myself with a will. Still there was nothing but my innate love of it to keep me steadfastly and steadily at work. As an instance of my utter want of guidance, I remember well how, on meeting in Wood's *Algebra* with a reference to Waring's *Meditationes Algebraicæ*, I teased my brother to procure for me a copy. After a diligent search among the second-hand book-shops, a copy was at last procured at the exorbitant cost of two guineas. Alas! the ponderous old English analyst proved almost too much for even my perseverance, and I gained but little or no light from his writings, except a tendency to distrust learned references for the future. I read, I think, Woodhouse's *Trigonometry* and some of Lardner's *Treatises on Analytical Geometry and the Differential Calculus*: they were the best expositions in their day, but scarcely suited for academical examinations. What pleased me most, and to me seemed as the revelation of light, was the half-successful mastery of Lagrange's modest volume on analytical functions: the book seized on my youthful imagination, and sealed me for ever as a lover of the concinnities of geometry and the exquisite

symmetry of its expressions when delineated by the hand of a master. About the same time also I had the inestimable advantage of attending a course or two of lectures on chemistry, given by Allen and Pepys at Guy's Hospital. The hours were counted till the days of these lectures came round, and ever after chemistry became to me, and has remained, a passion.

But in all this pleasing desultory work I had no companion of my own age, nor indeed of any age, excepting my two brothers, who did their best to express their sympathy, and whose kindness and encouragement have left an impression of gratitude on my affection never to be effaced. Of genuine boyhood, its games, and its generous friendships, I had no experience. Often and often have I looked down from the balcony on the roof of the University Observatory at young England disporting itself in the beautiful park beneath, and there by athletic labours preparing itself joyously but unconsciously for such duties of manly endurance as it may one day be called on to undertake: the sight of the contrast with my own youth has excited not envy, not grief, but rather delight in their happier lot, and thankfulness at their enjoyment.

I had almost forgotten that about this time the ambition of authorship had fired my young imagination, just as it has often seized other students so soon as they fancy they have mastered a new subject: they believe that they see it in a clearer light than it has been seen in before, and they long to communicate their discoveries to others. I doubt not that it was in this way that the late Bishop of Natal was impelled at the first to write his premature criticism on the theology of which he had then commenced the study. My own genius took a lower flight, and I succeeded in persuading an adventurous bookseller in a provincial town to publish a small brochure of mine* in the shape of an *Introduction to*

* *Introduction to Arithmetic*, published by Piper, Ipswich, 1825.

Arithmetic. Looking at this little book in the light of the present hour, I feel no shame at the contemplation. Even now it is far ahead of most of the arithmetics of the present day, inasmuch as every page of it teems with the attempt to encourage thought. The elementary properties of numbers are explained, and are demonstrated on the simplest principles, and no arithmetical process is presented to the tyro without the detail of the reason thereof. But, alas! these are just the very points that are useless in the modern form of suicidal competition: the reasons of things do not in general *pay* in the 'competitives.' I remember well how, a few years ago, when I was examining the candidates for certain valuable appointments, I put the rudimentary question as to what numbers are divisible by eight? The fact may seem astounding, but it is true, that out of sixty candidates I did not get the question answered. It was too simple, too practical, too much entering upon the reasons and roots of things to have ever been pointed out by the 'coaches,' or to have been elicited by the curiosity of the students. All such simple and instructive matters are attended to in my brochure of fifty years ago, and were well known to me when fourteen years of age. I owed the first knowledge of them to the 'private adventure' school of the zealous schoolmaster at Poplar.

What joy was mine when at length I found that friends were gathering round me, who agreed to furnish the funds necessary for an university career. Among them were kind relatives, some of them highly gifted and eminent clergymen, who served God and their country in the generation before your own. Two of these I cannot deny myself the pleasure of mentioning. One of them was my uncle, Thomas Mortimer, the much-loved lecturer of St Olave's in the Borough, and Vicar of St Mark's, Myddelton Square, one of the most popular and useful clergymen in his day, specially among young men. The other, also my uncle, was the Rev. William

Bolland, formerly Fellow of Trinity College, Cambridge, and Vicar of Swineshead in Lincolnshire. These excellent men upheld me in my temporary low estate. One condition, however, was attached to the accordance of this pecuniary help: I engaged to refund the sums that should be necessarily expended on my career at Cambridge, so soon as I should acquire the means. Happily for me these means were acquired in due time, and the debts were discharged. From my heart I say, even at the present hour—*Deo gratias*.

In my choice of a college I was left, as in most other things, pretty much to my own devices. I had read with feelings of emulation the memoirs of Kirke White, and with even greater sympathy those of Henry Martyn, and my sentiments were impressed by the record of the kindness shown to the latter at the hands of the much-regarded tutor of St John's, Mr Catton. The poet Wordsworth also had been a Johnian, and for his poems I had conceived a passion, unpopular as they were at that day. These considerations, inadequate enough in themselves, were operative in my final selection of St John's. I do not doubt, however, that I was also much influenced by the repute of the college as offering peculiar encouragement to needy and promising students.

In this way, just after Easter 1826, I found myself at St John's College, Cambridge; and in recording the fact I cannot avoid the association which recurs to my mind, that just sixty years afterwards I find my name enrolled in the closer relation of an Honorary Fellow. A solitary student I was, but thankful then to be there on any terms. Not that I had no introduction to the college tutors, but I knew not a single person there of my own age, and happily for me, I was plunged at once into the thick of the term's work, with an examination impending before me within six weeks. Nevertheless, I was not at the time painfully conscious of loneliness, for there lay the work and the goal

plain before me ; the work pleasant, though anxious enough ; the goal, an honourable provision for life. I cannot truthfully say that no higher motives and hopes possessed me, but the *argumentum ad crumenam* is absorbing in its appeal. I believe that the more prevalent feeling of the moment was connected with the consciousness that at length I was surrounded by grand opportunities for learning, and that I was at length in contact with minds highly cultivated, and animated with many sympathies akin to my own.

For in those days—some would now regard them as antediluvian and sunk in Cimmerian darkness—our lectures were *viva voce* ; not truly lectures in the usual sense of the term, but strictly catechetical, and on subjects for the most part prepared beforehand. We sat on chairs ranged round the walls of the room, with the tutor at a small table in our midst. We had nothing in our hands excepting an unannotated copy of some classical author, or were presented in our turns with a cardboard, on which diagrams were drawn relating to the mathematical subject before us. Then came the logomachies between the tutor and the undergraduate ; often amusing enough, and frequently very instructive to those who came seriously to learn : sometimes they were tedious, the results varying with the skill of the tutor and the capacity of the examinee. One consequence of this arrangement was, that both tutors and students became in due course well acquainted with the attainments and mental capacities of the men in each year, and we could always make a reasonable guess at each man's final place in the Tripos.* All this is now changed, and, as I regard it, changed for the worse ; for the college tutor now simply reads his lecture for an hour, while the students take such notes as suggest themselves to their inexperience.

Of formal college examinations at St John's, there were

* This form of divination appears, in spite of the following sentence, to be not wholly extinct at Cambridge.

two annually, in May and in December. The college subjects were all planned beforehand with great forethought and skill, arranged for a three years' course. They consisted of a considerable portion of one Greek and one Latin author selected for each biennial examination. To these were added two or three definite mathematical subjects, progressive in their character, a Gospel in the original Greek, and some one moral subject, under which term were included in my day Paley's *Moral Philosophy*, Locke on the *Human Understanding*, a book on Logic, and Butler's *Analogy* in two portions. These college examinations were conducted with as much care and formality as those in the Senate House or for the classical Tripos. The sum total of each man's marks in all the subjects combined was added up, and our places were publicly exhibited during the space of six months in the college hall. Prizes of books were awarded to each man whose name appeared in the first class both at Christmas and Midsummer, and Exhibitions of greater or less value were also assigned to such students as most distinguished themselves, or who needed assistance, with the probability of their making a good use of it. The amount of aid thus accorded by this noble and bountiful college might, but for the facts of the case, have been fairly deemed incredible ; still it was never prodigal. A system of this sort was pre-eminently adapted to elicit the intellectual powers of any man, and to educate him all round ; for if the student desired to stand well with the college authorities, the necessity of accumulating marks in each and all of the several biennial subjects of examination formed a very powerful stimulus.

Plunged thus suddenly into the midst of these new activities, how was I to come out in this my first college examination ? I had had no proper preparation beyond what I could give myself in a general way before reaching Cambridge. I entered the college also nigh to the end of the half year, and was not expected to be examined in

every part of the first year's subjects, I had never undergone a literary examination before, what then shall be the issue of this first essay? I shall never forget how, so soon as the result was posted up in the college hall, I turned to see my fate. I was conscious of a great obstruction in my throat, the old sensation known to us all, and a flush came over my face as I read the unexpected words: 'Pritchard highly distinguished himself in all those parts of the examination which he attended.' Thus my first conquest was assured, and I felt that I had ground for strong hopes of ultimate success. I learned, also, from indirect but reliable sources that from the results of this examination, and almost equally from the daily tortures undergone at the hands of the college lecturers, I had raised expectations that eventually I might 'do the college credit.' Thereupon a Fellowship began to loom in the future, while, for the present, I was both encouraged and assisted by an Exhibition of some value.

Months passed away after my first attempts in a college examination. I now was better informed as to what I ought to read, and how to read it. At that time the most important parts of the tuition were carried on by private tutors. In general the pupil sat by his side for one hour daily, and this time was mostly occupied by the tutor himself 'writing out' for his pupils, with a running comment, some propositions of special importance, which were either contained in no English book, or else seemed capable of a better development at the tutor's hands than the books contained. And these books were few. I am writing of the year 1827, when private tutors were not designated by the expressively equivocal name of 'coaches.' At that day written instruction was contained in MSS. originating in or endorsed by the college tutors, though at the same time much of it was confined to the private MSS. of the private tutor himself. In relation to this question of private tuition and of its great importance to the student,

I must here mention that in due time the college authorities inquired as to my pecuniary means for defraying the cost of a tutor, under the view of supplying me with that needful direction : a truly generous offer, involving as much, in those days, as seventy pounds for the entire academical year and the long vacation. Happily for me, my friends advanced the necessary sum on the condition already stated, that I should refund it when more prosperous days arrived. The tutor I selected was Charles Jeffries, the Second Wrangler in Airy's year, and his memory I hold to this hour in affectionate reverence. The moments I spent at his side were golden, felt to be such at the time ; and even now I occasionally look at his scrawls on pieces of paper, relating to this subject or that, full of meaning. So my progress was rapid, and my style of thought and of expression daily improved. For lucidity of mind and elegance of mathematical conception I have not met with his equal. The recollection of this man's goodness often and often recurred to my mind when some of yourselves sat at my side, and if I did not consciously imitate him, I felt taught and directed by the memory of his example.

The time went on, but to me half unconsciously, its intervals being marked out only by the recurrence of the biennial examinations, in which it was essential for me to maintain one of the foremost places : I was invariably second man of my year, the first place being, it seems, beyond my reach. The consequences of this success were that year by year I was rewarded by prizes of books, and the gradual accumulation of Exhibitions, ultimately sufficient to defray all necessary expenses. Of course this generosity was not confined to myself, but was extended equally to other men deemed worthy of college encouragement.

I have already spoken of the varied curriculum of the college system of that day as being by no means confined to mathematical training. The study of divinity was

exacted from us, and we were guided not solely by the college lectures, but by the examination papers set at the biennial examinations. In this way, among other subjects, I was led to commit the major part of Butler's *Analogy* to memory—to me a possession stored up ever since among my most cherished sympathies. And here it may not be without some interest to relate that after an interval of some thirty years and more, when in the vestry of a country church, I met an old college friend, who told me that he had just come from a visit to my most honoured college tutor, Richard Gwatkin, from whose mind and goodness I had learned so much at Cambridge. He told me that I had been the subject of a recent pleasing conversation, wherein Mr Gwatkin had narrated how, at Cambridge, in years gone by, he had week after week in the college lectures done his best to overthrow me at Butler's *Analogy*; but, said he, somehow I invariably failed. Did my revered old tutor fail also to discern the causes? I loved my subject, I tried to understand it, and I knew it by rote. If I mention this little matter in these brief *Annals*, it is partly because Dean Bradley, in his article* on the Clapham Education, refers to the Butler lessons, of which, perhaps prematurely, he was made the recipient. Yet, in point of fact, I think that all generic truth is essentially simple, and that accordingly Butler's grand argument, carefully expounded, lies within the reach of ordinary intellects, and even touches ordinary affections. The *Analogy* was effectually backed by many sermons from that most learned and instructive preacher, J. J. Blunt, the Regius Professor of Divinity of that day; and you may remember, some of you, how his *Undesigned Coincidences in the Old and New Testaments* formed a part of your curriculum at Clapham. These I had listened to as delivered from the university pulpit. Archdeacon Julius C. Hare

* *Nineteenth Century*, March 1884.

also by his inimitable sermons as select preacher, contributed greatly to form the theological bias of my own mind ; and if to these I add the writings of Coleridge, and those of the accomplished and large-minded Isaac Taylor, I think I should nearly exhaust the authors who during my undergraduateship laid the foundation of my theological predilections. I was induced by Isaac Taylor's remarkable essay on 'Saturday Evening,' to clear away all secular books on the early evening of the last day of the week, and during three years of my Cambridge course I devoted it and the Sunday to quiet thought, apart from academical studies, and it is to this quietude and rest that I attribute in part the prolongation of my life. Moreover, the abiding influence on my mind and on my moral sentiments, arising from the writings of the great authors above mentioned, may, I am sure, be traced not only throughout the homilies preached in our Clapham School Chapel, but in many of my more public addresses at meetings of the British Association, and in essays read before many a Church Congress.

The time at last came for the final trial of the Mathematical Tripos.* Herein I was told by the college authorities, who for three years had watched my career, that I had not realised their expectations. Perhaps not ; but I had fulfilled my own hopes, which a better knowledge of my deficiencies led me to entertain. My degree, after all, was high enough to secure a Fellowship, and the means of refunding the cost of my education, and, better still, I knew that my reputation extended even beyond my place in the Tripos. Three men obtained higher marks than myself, my besetting infirmity being a certain nervousness or uncollectedness, which prevented my producing at the moment what in a cooler frame of mind was well within the scope of my knowledge. As an instance of this, I may mention that on one winter's midnight, with the snow upon the ground, and within a week of the

* In 1830.

examination, the most distinguished man of the year came into my rooms to ask for the explanation of a knotty point in the Lunar Theory; this I readily gave him. The question itself was actually set; my friend wrote it out—I did not! I do not mention this to my credit, but it may remind some of my 'Old Boys' of an idiosyncrasy of mine which they may have noticed.

I was now landed on the road to competence—is it affectation to say to usefulness? Private pupils, as usual, were at once offered to me in abundance, for I had the reputation of thoroughly knowing my work and for carefulness in the doing it. I undertook but a very few pupils, only sufficient for my maintenance, for I was desirous of devoting the greater part of my time to classical studies. And this I did, partly because I was unwilling to risk the Fellowship examination, which was wholly classical: partly also, I was led to it from the love of the thing itself. Here, again, for eighteen months I enjoyed the inestimable advantage of a tutor possessed of a rare intellectual capacity: I refer to the late Sir William Martin, then Classical Lecturer at St John's, and afterwards Chief Justice of New Zealand. I had already, while an undergraduate, enjoyed the pleasure of instructing him in mathematics, and now he was to repay me in his own speciality. He was a scholar deeply versed in the philosophy of the Greek and Latin languages, possessing a singular insight into the logical simplicity of their construction; and it was not long before he removed the haze in which the pedantry and insufficiency of the existing grammars had involved what was in itself transparently clear. Under his guidance, I read the more salient and characteristic parts of many ancient writers, and soon became enamoured with the charm of the inimitably incisive character of the Greek intellects. Of this clear insight into the majestic symmetry of the Greek language, thus acquired, you were made the partakers at Clapham: some of it was presented to your mental vision



in the shape of two or three leaflets entitled *Notabilia Quædam**—a brochure which attracted the notice of the Dean of Westminster in his article in the *Nineteenth Century*.† It is still published by Messrs Bell & Son, and I think has, even at this late day, lost nothing of its value. The Clapham boys were without excuse if they blundered in the construction of the Greek or Latin moods or tenses, or in the mazes of the Greek prepositions and their attendant cases, or in the greater mysteries of the particle *ἀν*.

Meanwhile, though chiefly engaged in imbibing and assimilating the knowledge of other minds, I nevertheless ventured to some extent on more original grounds. During my undergraduateship, I had been greatly struck with certain trigonometrical relations brought to light by Poinso^t, especially as elucidated by the new ideas which had now begun to dawn on the true interpretation of what had hitherto been termed 'impossible quantities.' These speculations led me to other writings of this great mathematician, specially to Poinso^t's doctrine of statical couples. I became so enamoured with the singular power and wide application of this new idea, throwing a clear light as it did on much that had hitherto been obscure in the theory of mechanics, that I could not rest until I had simplified the subject and brought my joy and my light within the ken of others.

The little treatise on *Statical Couples* was soon published: it was adopted in the general university teaching; it ran through two editions, and was ultimately absorbed in other treatises on mechanics, generally without acknowledgment. To this publication I also added the product of my first essay in original research; it consisted in a simplification of the

* *Notabilia Quædam*, or, The Principal Tenses of such Irregular Greek Verbs and such Elementary Greek and Latin Constructions as are of constant occurrence.—G. Bell & Sons, London.

† 'He took,' writes the Dean of Westminster, 'the bold step of flinging, not without some words of iconoclastic ridicule, our Latin Syntax to the winds, and substituting a few—a very few—rules, that he gave us on a blackboard.'

final propositions in the mathematical treatment of the figure of the earth, considered as heterogeneous. I had read it before the Cambridge Philosophical Society, of which I had become a member.

At length the long-wished-for Fellowship was gained in March 1832, and with it suspense vanished as to pecuniary competence and the repayment of the educational loans. Pupils again flocked to me in superabundance; of this run of fortune I was now free to take full advantage, and judging from the places attained by most of them in the Tripos, both they and I had reason to be satisfied. It was soon communicated to me that at a very early date I should be invited to take an active share in the public tuition of the college. This I had myself, perhaps not unnaturally, expected; but it was not to be. Looking back now through the vista of half a century, I cannot wholly satisfy my mind as to all the motives which impelled me, at so early a period of a successful academic career, to relinquish the natural hopes and ambitions which must have legitimately presented themselves.

Three alternatives presented themselves: I might pursue natural science, or divinity, or chemistry; for each of them I possessed, or I thought I possessed, the elements necessary for future usefulness, perhaps I might even say, for distinction in original inquiry. Then, again, I was fond of teaching—that is, I was then and still am pleased in making others the sharers in the charms which result from the influx of fresh light and the acquisition of new knowledge. But, notwithstanding all these opportunities, which might in some points of view be well regarded even as sacred, nevertheless I determined to quit the university life, just when it was dawning brightly upon me, and seek my fate in the larger world outside it.

‘Qui fit, Maecenas, ut nemo quam sibi sortem
Seu ratio dederit, seu fors objecerit, illa
Contentus vivat?’



It might have been impatience: looking back through the busy occupations of many subsequent years, I am inclined to doubt if I could have occupied them more advantageously in any other *rôle* of life than that in which I have actually engaged.

‘There’s a divinity that shapes our ends,
Rough-hew them how we will.’

Now it so happened that about this time—I am writing of 1833—many new proprietary schools in connection with King’s College were in process of establishment in almost all the suburbs of London, and here and there in the Provinces. The main object in view was to secure for the sons of the comparatively well-to-do residents in these suburbs a better form of education than at that time was procurable, except at a very few of the large and expensive public schools; and these new schools were to be brought within easy distance of the homes of the boys. Nothing, as I think, in the way of education, can be more desirable than this arrangement. Granted that the home is favourable, what is wanted is a large school presided over by masters of culture and ability, while at the same time the boys are retained within the amenities and protection of family life. This arrangement applies in my mind to all boys up to the age of sixteen or seventeen. Most of these are draughted off to active commercial or professional life; those who are intended for a university career, could at that place find ample field for the cultivation of what are regarded, and properly regarded, as manly and social virtues. The schools should be large, say up to 250 or 300*; sufficiently so for the formation of a healthy public opinion; and the education arising from the conflict in school games might be, and ought to be, provided for on

* Dr Arnold placed the limit at about 250. The headmaster, he thought, should know something of all the boys personally.

the same scale and in the same way as exist in the larger public schools at present. Nothing, I think, can excuse the general delegation of parental authority and influence, so prevalent at present. The monotony of school habits and of the forms of education, teeming in the present generation, is neither healthy nor tends to elicit the virtues of individual character. The expense too of education on the modern system is grievously and unnecessarily enormous, and entails trouble and anxiety on families possessing only moderate pecuniary means. Schools such as I have just hinted at should be broadcast over the land. Nothing in this scheme would necessarily clash with the existence and prosperity of the anciently endowed great schools, which have long formed the pride and ornament of England. They would still be open to the sons of the wealthy, who preferred the discipline of a master's boarding-house to that of home and the day-school combined.

Be this as may, it was something of this sort that was aimed at by the promoters of the proprietary schools, though for the most part they had no clear idea of either what they really wanted or how to realise even their own projects. The main principle which seems to have mastered all others was parsimony, and thereby they miserably crippled the income of the principals of these schools, ungenerously forgetting that excellence even in commercial ability is generally not to be commanded excepting at an adequate cost. Besides this there was the perpetual interference of the governing bodies, or committees as they were termed, consisting rarely of men of any adequate intellectual culture, and no experience in school government.

Now it was at the head of one of these establishments that I, in my inexperience, was contented to be placed: my election was carried not without a considerable struggle, and my supporters and myself were never forgiven by the minority of the committee. I mention these things solely



for the elucidation of the consequences which soon arose in the sequel, and which before long led to the establishment of the school at Clapham under wiser and more liberal conditions.

As I have already explained, my own experience of two great public schools, at which for a certain term of my life my own culture, mental and moral, were left to run wild, was not impressive, excepting so far as it had taught me what to avoid. I was in this way left to form a plan of education for the new institution, out of my own knowledge and reflection, untrammelled by any traditions. This I did sincerely, and with all the thought and deliberation that I could command. Accordingly, I embodied my thoughts and the resulting plan in a somewhat elaborate address, which I delivered in due form before the Proprietary of the Stockwell Grammar School, on the occasion of its opening.* This address lies before me at this moment, and with all the experience of half a century superadded, I can say with sincerity, that had I now to form a scheme of education for a large school, it would be on the very same lines as those enunciated in my inaugural address.

This plan of education was based upon the study of the Greek and Latin languages, for reasons not here and now necessary to give. But then this education was by no means to be confined to these ancient tongues, including the literature expressed therein. I proposed a considerable infusion of elementary mathematics, such as might be well within the reach of boys of ordinary abilities; and beyond all I proposed to introduce a systematic course of instruction relating to the physical phenomena in the midst of which we live and move and have our being. I thought it then, and I think it now, preposterous to regard any man as thoroughly or even moderately well

* August 1833.

educated, unless he has some intelligent acquaintance with the physical nature of the food he eats, the water he drinks, the air he breathes, and of the general structure of the heart which beats within him. Nor was I indifferent to the duty of imparting to the boys some rudimentary acquaintance with the great men who had lived before us, and with the literature which some of them had left behind them. Beyond all, and as the foundation of the whole scheme, I laid it down as a maxim, that the main intention of early education should be the development of *the habit of thinking*, and the exhibition of the right mode of setting about it. And here I gladly admit that the small problems, within the reach of a boy's capacity, which constantly occur in the groping out of the meaning of Greek and Latin sentences, by the aid solely of dictionary and grammar, form an invaluable element in the development of the understanding. In addition to the foregoing considerations, and as occupying an important part in the educational scheme, I insisted on the necessity of providing '*resources for the leisure hours of maturer life*,' and this provision was to be made by the removal of obstacles which invariably intervene, and are often deterrent, in the acquisition of the first rudiments of the knowledge of natural phenomena—a term now sufficiently abused under the name of science. For instance, I had myself a lively impression of the difficulties encountered in the mastering of the first elements of descriptive botany: three times I was foiled in my endeavours to overcome the difficulties inseparably connected with the printed treatises; and I was at length relieved, simply by the aid of some slight personal elucidation in the field. So under these convictions I resolved that the boys in the new school should in all such matters have the benefit of my experience.

If it occur to any of you that what I here insist on is,

after all, nothing beyond the form of education adopted in our ordinary modernised schools, then my reply is twofold. First, the introduction of a well-furnished laboratory, and serious instruction in natural phenomena at the hands of a well-cultured instructor, were *at that day* a novelty; and herein I think I may fairly claim to have been a successful pioneer in a most important branch of education. Secondly, even when this introduction of science, as it is called, is adopted in our modern great schools, it invariably holds a very subordinate place in the curriculum, the learning thereof is generally left to the choice of the boy, and the teaching thereof is relegated to men of inferior education. This last item is the more serious of the two, and is often fatal to the mental development of those who are subjected to it. There is also, even at the present day, a serious obstacle to the pursuit in schools of knowledge not classical, in the fact that classical teaching is the only form of instruction in England reduced to a system and a routine; the form of teaching mathematics or science depends on the individual idiosyncrasies of the teacher: no system, so far as I know, has yet been adopted or worked out; and in most instances the headmaster of the school has not made it his business to acquire the requisite knowledge. With reference to modern languages, although the importance thereof, both for purposes of commerce and for social intercourse, is day by day becoming better understood, there still exists a very serious obstacle for English boys, arising from the habitual eccentricities of the class of foreign teachers who come to this peculiar island of ours. Herein I proposed to do solely what I could.

Such, then, is an outline of that form of education which I proposed to introduce into this new proprietary school at Stockwell, and which I ultimately did fully carry out at Clapham. I proposed that all boys alike should be subjected to it, until about the age of sixteen; at which

age I conceived they might be advantageously drafted off to instruction of a more special character, whether for the universities, or for any other purpose. A boy thus taught and thus intellectually disciplined, would be fit for any pursuit. But here I have often heard an objection raised, and the question is asked: Where is the *time* to be found for such multifarious instruction? I reply, in the systematic accumulation of small increments: but it must be systematic, and beyond all, it must be sincere and impartial. For instance, take a modern language. Let anyone calculate what would be the effect of learning ten or twelve new words daily in its vocabulary, during a year of forty weeks: this would not require half-an-hour per diem, and making all due allowances for the burden of the accumulation on the memory, at least fifteen hundred words would be learnt—an amount exceeding the practical requirements of the case. This applies only to the vocabulary; but then this is the chief difficulty, and I would ask in what school is any such system, or I fear any thoughtful system at all, adopted? The truth is that between the ages of twelve and sixteen, the all-round system of education I proposed, must, if sincerely followed, issue in results utterly beyond those which are ordinarily achieved. In the observatory under my direction at Oxford, in order to complete the research for stellar parallax by the aid of photography, upwards of seventy thousand careful measures must be made of the distances between the images of stars upon the photographic plate. The number, nay, the very mention of it, seems appalling; but by steady and systematic accumulation, the work will be completed without any stress of mind in less than a year. So, as I have insisted, the acquirement of the rudiments of an all-round education is well within general reach, by the adoption of system and sincerity, between the ages of twelve and sixteen. The *competitives* stand in the way; and the time will come

when the *competitives* will be found to be intellectually and educationally suicidal.

So the Stockwell Proprietary Grammar School in connection with King's College was duly established in January 1833; and, generically, on the lines explained above. But the relations between me and a portion of the committee, or governing body as it would now be called, were from the first strained, and as time went on the tension increased. They could not understand my rejection of the Eton Latin Grammar: moreover, even a rudimentary knowledge of nature was not necessary, they thought, for boys intended either for commerce or for the university; and neither I nor my friends could be forgiven for placing our opponents in a minority. Meanwhile, the school flourished numerically, and in a few months the limit of number, one hundred and forty, was reached: the committee declined the many supernumerary applications, and as thereby both the ambition and the expansion of the stipend of the headmaster were alike effectually curbed, the whole affair began to 'work' what the judicious Hooker calls 'sensible smart.' Still, my occupation in other respects was extremely pleasant to me. A famous grower of auriculas, when questioned by a friend as to the process he adopted for his eminent success, replied as follows:—'Dear Sir,—If you wish your plants to thrive you must, by frequent presence and attention, teach them to *know you*. . . .' So my more immediate classes learnt to know me, and they thrived accordingly. I had also the extreme good fortune of finding boys who were possessed of far more than ordinary talents, and who were ready to respond to the calls which I made upon their attention. I may give the names of three of my first Stockwell pupils, whose subsequent careers would be considered ornaments in the roll-call of the worthies of any school in the kingdom; so I will mention the present Dean of Westminster, Dr Bradley; Sir George Grove, so

well known in so many lines of accomplishment; and George Hemming, who subsequently became Senior Wrangler, and is now the consulting Counsel to the University of Cambridge.

For about a year and a half the strain and the jading from a portion of the committee continued unabated: these gentlemen, though no doubt amiable and honourable enough in their own individual spheres, nevertheless, as governors of a place of education, were wholly out of their beat, and by a ceaseless interference and sundry small annoyances, they made the headmaster's life unenviable, and at length I finally resigned my connection with them. And yet the retrospect of those busy months at Stockwell is even now grateful to me; not alone from my close and pleasant association with young boys possessing much intellectual ability and moral excellence, but even the other boys, not under my immediate tuition, seem to have been reached and impressed by that sort of influence which pervades every school directed with sincerity and ability. It is not more than two years ago, that I received a letter from one of the then youngest boys in the school, expressing the benefits which he says he had felt through life from the good influence described by him as having penetrated even to his low position in the school. As to the elder boys, a silver cup * usually stands on my sideboard as a memento of 'their affectionate regard.' Other pleasing reminiscences also

* One of these elder boys, Mr Hemming, Q.C., describes the presentation of this cup, the subscription for which had been kept a dead secret. 'Pritchard had made a speech in presence of committee and parents and boys, explaining his withdrawal,' when up marched unexpectedly the spokesman of the boys, and gave him the cup with some words of appreciation and gratitude. 'Pritchard was thoroughly taken by surprise, and without a moment's thought of what he would say he sprang up and gave us a burst of genuine eloquence such as I hardly ever heard from anyone.' 'He pointed to the committee who sat behind him, and pictured the slights and scorn which he had met with there.' Then he turned to the boys, dwelt on his pleasure in teaching and their merits in learning, and finally 'concluded with "These are my witnesses," and lifting up the cup, "This is my trophy."'

I still possess of services said to have been rendered and appreciated, during occasional ministrations in Stockwell Chapel.

So in June 1834 I left, sorrowfully but without hesitation, the Stockwell Grammar School in connection with King's College, London, with the intention of returning to the more peaceful occupations of a university life. But, again, this also was not to be. I remember well how, one day shortly after my resignation, I sat down with my former most excellent and able second master* (who, by the way, was speedily treated more perversely than even I had been), and we drew up together what we considered might be a workable constitution for a proprietary school. It was drawn up solely for our amusement, but it was well conned over on all its sides, little imagining at the time that it would ever be adopted in fact. But the truth was, very many of the parents among the proprietary took the same view of the external management of the school that I did myself, and a considerable number expressed their wish that a new school, under better and more liberal regulations, should be established elsewhere, and be placed under my unfettered management. I told the gentleman who, in the name of others, was deputed to make the proposition, that I was ready to superintend such an institution, but, if I did, its fundamental regulations must be almost antithetical to those which had collapsed at Stockwell. I laid before them the scheme which I had, under such singular circumstances, drawn up, but it was accompanied with a quiet feeling of despair and of indifference as to the view to be taken of it. To my surprise it was accepted as reasonable and hopeful. The main principles of the external government proposed were as follows. The committee was to be small; the headmaster was to assist at all its deliberations; the pecuniary terms were to be arranged on a much more

* The Rev. William Hodgson, subsequently the much-respected Vicar of Brathay, at the head of Windermere.

adequate scale; the committee was to take charge of money matters alone, not interfering with the main plan and course of the education, which were understood to be framed on the same lines as those commenced at Stockwell. There was also provision to be made for any possible extension of the numbers admitted to the school, and the arrangements for the boarding were to be left entirely in the hands of the headmaster, subject to the condition that the terms were not to be so excessive as to be beyond the reach of the well-to-do inhabitants of the neighbourhood.

On this basis, then, what was known as the Clapham Grammar School was established in August 1834. It was, in fact, a proprietary school on a more liberal scale than the kindred institutions round London; it was also freed from the element of interference, which had proved so disagreeable in all these schools, and so fatal in the Stockwell case. The new school progressed greatly year by year, and as the numbers increased, so new class rooms were added, and before long a lecture room with its contiguous laboratory was established, and gradually furnished with all apparatus necessary for the elucidation of chemical and physical phenomena. Most happy was I in my work, for I had unmistakable evidences that the young minds around me were budding up into the promise of much fruit. After the lapse of a few years, some seven or eight, the school attained to unusual dimensions, specially in the number of the boarders, and the committee of management became, I suppose, alarmed or dazed, and conscious of their own inexperience in the management of so formidable an institution. Excellent men they were, and to me most excellent friends, but they were necessarily not men of academical minds. They had, without due expectation, established a great school, the dimensions of which they had agreed not to curb, and they were becoming half-frightened at the presumed ambition of their headmaster.

'You will soon ask us,' said one of them to me, in friendly discourse, 'to build you an observatory.' That was said, I presume, prophetically; for, in a very few years, I actually did add an observatory* to the other institutions of the school; and this, in due time, led up to the establishing of the beautiful observatory belonging to the University of Oxford. It is a familiar saying that we know not what a day may bring forth: at the time in question I could not dream that these efforts would ultimately land me in Oxford.

So the committee of management, seeing that their original intention of establishing a good school in their immediate neighbourhood had been realised even beyond their expectations, suggested to me, in the most friendly manner, that I might possibly feel more at liberty to pursue my objects, if they handed the entire management, funds and liabilities over to myself. In some respects it might have been better if I had not accepted this generous offer without reserve; I might, with the prospect of great advantage, have sought for the aid of other minds more experienced in the trusteeship and governance of public schools, and have started afresh on enlarged foundations. But the growing population of the place, and other circumstances, would soon have rendered a change of habitation necessary for such an institution; so I accepted the freedom thus kindly offered, and with it all its responsibilities.

* Prof. Alexander Herschel, who, in 1895, made a pilgrimage to Clapham, with the purpose of learning what had become of the old school buildings and precincts, reports that this observatory is now destroyed, and a new street, St Luke's Road, carried across its site. It contained a transit instrument, which he describes as a 'very beautiful one, shown by Troughton and Simms as their *chef d'œuvre* at that time in the Great Exhibition of 1851, and bought (for £200, I used to hear him say) by Prof. Pritchard from the makers very soon after the close of the exhibition.' Prof. Herschel, who was at Clapham in 1855 as a pupil, and again in 1860 as an astronomical student, relates a somewhat curious burglary at the observatory, of which a micrometer formed the principal spoil. Sir John Herschel replaced this micrometer: what the thieves did with it remains unknown.

I at once added two new institutions to the establishment; the one in the shape of a swimming bath, and the other was a school chapel, each of them implying a corresponding addition to the roll-call of the boarders. To the school now flocked ever increasing numbers: they consisted very much of the younger sons in families where the elder brothers were sent to more expensive schools, such as Eton, Harrow and Rugby. Another important element was derived from the sons of men at the head of the several branches of science and of the liberal professions. The names of Airy, Darwin, Gassiot, Grove (Sir W.), Hamilton (Sir W.), Herschel, Maurice, etc., became familiar in the roll-call, and, in due time, we could number among the 'Old Boys' a Senior Wrangler, and many other men distinguished at both the universities, and especially some who eventually attained to rare distinction in the army. Nor were we less advantageously known at Haileybury and Addiscombe. Twice we furnished the head students of these colleges.

Such, then, was the material and scholastic progress of the school. As to the form of education, it was precisely on the lines already explained, with such modifications only as arose from the necessity of adapting it to a large establishment of boarders. But I may here repeat, that my great aim was to establish *a habit of thinking*; and another great aim was, as I have also said before, to provide resources for the leisure hours of after life, by removing those rudimentary difficulties which invariably beset the commencement of the study of Nature in its several aspects or departments. In the form of the instruction which I gave, I kept in view the principle so admirably enunciated by Horace:—

‘Segnius irritant animos demissa per aurem,
Quam quae sunt oculis subjecta fidelibus et quae
Ipse sibi tradit spectator.’

There was scarcely a boy in the upper forms of the school who could not draw with reasonable skill a good diagram of a condensing steam engine; a chart of contemporaneous history, ancient and modern, from memory; and a genealogy of the dynasties which have occupied the throne of England, etc. Every boy in the school, with the exception of the youngest, was expected to attend the weekly lectures on chemistry, and some other branches of natural philosophy, and subsequently to draw from memory the various apparatus employed in the illustrations. These lectures I invariably delivered myself, partly because I felt them to be of serious moment as respects the subject-matter discussed, and partly because I held it to be a matter of prime importance that the minds of as many boys as possible should come into contact with the culture and experience of my own. The tenet of the auricula-grower, already explained, was at all times in my thoughts; for I wished these young minds to 'Know *me*!' Often and often, in days not very long gone by, have I met in the streets of London 'Old Boys' who, after our mutual greeting, have proffered their acknowledgments for this portion of their school learning.

The teaching of the first rudiments of geometry I took especially under my own auspices: I believe I was induced to take this trouble from having heard that the difficulties of geometry are regarded as insuperable to some minds. My own conviction, on the contrary, was and is, that our mental faculties are so constituted, that every man responsible to his Maker for his reasonable actions, is competent to master the rudiments of geometry. Plato thought so, some twenty centuries ago. On the other hand, it is possible, and it is not unfrequent, for a pseudo-teacher to disgust his pupils, and alienate them for ever from a knowledge and a discipline priceless in their character. I fear this is often the case in those great

schools where the cultivation of Greek and Latin is regarded as the one thing needful. I believe that a part of the truth lies in this, that the teaching of the classical languages has been in the course of ages reduced to a communicable system, and can be taught as a routine; whereas instruction in the rudiments of mathematics is left to the haphazard of the teacher. My own method, some of you may remember, was as follows: so soon as a class of some fifteen to twenty boys, about the age of fourteen to fifteen, could be got together to commence geometry, I began my pleasant work. The first question I put was, 'What *is* Euclid?' Various notions were elicited, but the reply I wanted lay with me alone, and this reply was to be repeated by each of the tyro-geometers: 'Euclid is that which is not to be learned by heart.' This part of the lesson being secured, I proceeded to the second part, namely, to the promise of a half-holiday to the whole school, if, in the course of the next fifty minutes, six boys could demonstrate logically and satisfactorily to their own minds and to mine, that *there cannot exist more than five regular solid figures*, that is, solid figures, all of whose plane faces are regular polygons. This, in fact, amounted to taking the end of the whole subject by storm. To effect this, all that was necessary was skill on the teacher's part, and intelligent attention on the part of the pupils.* The demonstration, which was strictly logical, was performed with the aid of a small lath of wood and the black-board, and specially by avoiding all definitions not required for the express purposes in view. In itself the thing was essentially simple, and required nothing more than an appeal to the common sense of boys' minds. I never on any occasion failed in my object; or rather, the young minds before me never failed to secure the half-holiday

* A good deal of stress, some of us may think, must be laid on the first of the two conditions.

for their companions. It is generally the pedantry of the mode of teaching which makes geometry distasteful: from the very necessities of our environments, all men are, more or less, born geometers, and every tolerable carpenter finds that to be the case.

I may mention here that when I came to the Greek definition of *Proportion* I was for years put to a feeling of intellectual distress. No modern geometer that I knew had succeeded in explaining the true *thought* which lies at the bottom of the apparently complicated character of this most important definition. Even De Morgan had tried and had failed. On one occasion, however, of this recurring mental distress, the beautiful simplicity of the Greek thought flashed into my mind. In a moment, while walking up to the black-board, I asked myself if 'Proportion is the equality of ratio' and if 'ratio is the comparison of magnitude,' how is that comparison to be made? The answer is obvious, viz., by the comparison of multiples of the magnitudes to be compared. Here then was *εὐρέχεια*, and the marvellous incisiveness of the Greek mind was revealed.

Every alternate year, we took elementary botany in hand—a science of incalculable benefit in any scheme of education which embraces mathematical study; for, whereas, the latter branch of learning depends on the formal precision of the definition of the things meant, descriptive botany, on the other hand, calls into play the rapid appreciation of minute differences, and an ultimate appeal to the balance of contrarities. It is in this way supplemental to, or corrective of, the mathematical habit of mind, and more nearly resembles the consideration of those presumptive evidences on which, for the most part, the conduct of life is determined. Botany was made pleasant by walks into the country, and by the old inducement of the promise of a general half-holiday so soon as at least

six boys could bring back to school specimens of wild flowers, illustrative of twelve natural orders; the distinctive characteristics of which they were individually to demonstrate to me. I do not doubt that my eminently distinguished old pupil, George Darwin, now holding the post at Cambridge corresponding to that which his antediluvian tutor holds at the sister university, remembers how he asked me one day to read with him certain portions of his illustrious father's book on *The Fertilisation of Orchids*. More than gladly I did as he desired, and in due time we succeeded in fertilising and ripening the seeds of *Oncidium Papilio*; but we did not succeed in our attempts to induce the seeds to germinate, as his father challenged us to do: the necessary environments were wanting.

Of the school sports, there is little need that I remind you: these engrave themselves on all our memories; pleasant hours, good fellowship, generous young friendships. If ever I felt gratification, or even a possibly pardonable pride, it was on the many occasions when I saw some thirteen or more of you mount the drag, looking just what none but educated English boys could look; and I had no misgivings that the honour of the school would be jealously guarded even in the midst of exuberant youthful spirits. There was no one but your boyish selves in those jubilant drags to restrain any possible forgetfulness of propriety; for of old time, the rule of the school had been the inculcation of a sense of honour. The pledge of the word was in those days implicitly relied on; yet there was no weakness felt or imagined in the powers that be, but an old experience of a heavy hand and a retribution, if ever the case demanded it. The successful inculcation of this sense, this rule of honour, made the government of a large school not possible only, but generally pleasant for me,



and for yourselves it carried with it a large access of liberty. The chapel holiday, as we called it, on the anniversary of its opening, you can never forget; the whole school let loose for the day, in parties for whatever destination each selected; Richmond, the River, the Crystal Palace, almost anywhere: and no evil that I knew came of this well-disciplined sense of honour, and my trust thereon. But I am wrong here; for a mishap did once occur, and I was called to order by a well-meaning clergyman in "an affair of honour," which issued in a disaster. I believe that in order to check a disorderly outbreak in a bedroom, I gave the inmates thereof an alternative, either that I should establish a "sneak-hole" and spy out the delinquents, or take the individual word of honour not to repeat this destructive pastime. The latter alternative was, as usual, accepted and relied on, and so I was at peace, as I thought. But not so; for an early post brought me a somewhat angry remonstrance from a clerical friend, to the effect that I had administered an oath to two of his sons. I confess I was utterly astounded; and on meekly requesting enlightenment as to what course he would himself have desired me to adopt, I in due time was informed that I ought to have requested a promise that 'by the grace of God, the boys would endeavour not to be disorderly in future!' I admit this was too much for my serenity, and after a short correspondence, I requested to be relieved from the example of boys subjected to such hotbed and insalubrious culture.

These recurrent holidays remind me also of the method adopted to teach your young ideas how to swim. The school swimming bath was, I believe, among other institutions indicating a novelty in that day, and a pioneering in a new direction of education. In order to secure that effective pressure which boys know so well how to apply,

it was instituted that so soon as six new swimmers could accomplish about a hundred yards, the school was to be assembled to witness the feat; and if, amidst the general shouts, the hundred yards were completed, then there was to be an adjournment for cricket. In this way, and with patience, it was a rare occurrence to find any boy who at the end of the season was unable to swim.

Having written thus far on the subject of the school sports, it may be well to make some reference to the school punishments, for in a large society offences must come. These all—that is, the sports and some of the punishments—were chronicled in the school journal, printed monthly, for the due handing down of the traditions of the place. One of these little volumes—that for 1858—now lies before me, and I therein find that the mode of punishment which I occasionally adopted had made the desired impression on the school at large. It seems from the record that some five or six young boys had contracted debts at a confectioner's, which they were unable to pay. An adjudication of bankruptcy followed, with a consequent sale by auction of such valuables as the young bankrupts possessed; but, inasmuch as the proceeds of the sale were insufficient to meet the debts, it was necessary to take their coats in pledge, in order to make up the deficiency. It so happened that the transactions occurred in winter, and for a boy to be coatless incurred the risk of a cold, thereupon each of the young delinquents was provided with a blanket, and ever afterwards the name of Esquimaux was attached as a soubriquet to their names. Relief came on the arrival of the proper remittances from home. Meanwhile, the more faulty tradesman was, to his dismay, subjected to the inconvenience of receiving payment by the same dribblets, and at the same intervals, as he had permitted in the contraction of the debts! I remember also that the practice of bolstering, which appears to have

been occasionally a fashion, was for a time put a stop to, by appealing to the boys' practical sense of justice; they had injured the bolsters, and had put them *hors de combat* for the benign purpose intended; it was therefore but fair that the combatants should replace them, they in return receiving the no longer effective furniture. But I was partly caught here in my own device, for the school environs abounded for some time thereafter with feathers! The fact is that there are few things more difficult in the government of a school* than the selection of deterrent punishments: all such are things to be avoided where possible, and all of them become ineffectual when often repeated. Some of you became great adepts at long cube roots with six figures in the roots: some of you also exhibited considerable ingenuity in abbreviating the process: anyhow, your handwriting was not crippled by the old and barbarous practice of writing out 'lines.' Corporeal correction, provided it is not regarded as disgraceful, appears to me to be the readiest and least objectionable mode of punishment for a young boy, say under sixteen: it should not be either excessive nor insufficient; neither should it be frequent. I generally offered the alternative of an equivalent in cube roots, the former being in almost all cases accepted; but if so, there was also an intermediate condition to the effect that the culprit should not exhibit his sense of inconvenience by any concurrent sound. The penalty thereof being a slight addition to his sufferings. A moral offence, on the rare occasions when such occurred, I never regarded as corrigible by such means: the offence was regarded as a disease, and treated in a more serious way.

Having thus disposed of the sports and punishments incident on the school life at Clapham, I proceed to that

* Sir Wm. Herschel, who had opportunities of studying this question from the opposite side, admits that 'Pritchard's castigations were sometimes clever.'

which formed a very distinctive and important element in the educational discipline; I refer to the school chapel and its accessories. The origin of this institution lay in many causes, and sprang from many motives. The school had in fact become too large for occupation in a single parish church, and, moreover, I was not comfortable in altogether divesting myself of my functions as a clergyman. I had, indeed, already not unfrequently called the school aside on a Sunday afternoon to the lecture room, and there addressed a few words on the things that remain, while all other things fail; but I soon felt that this practice was inadequate. In accordance with boy-nature, a somewhat irreverent name was at once invented for these addresses — they were profanely called ‘Ebenezers!’ that word having formed my text or motto at our first assembly. I am glad to express my entire forgiveness to the dear ‘Old Boy’ who was the author of the humorous term, specially as, on the occasion of the ‘Ebenezer’ which I addressed to you all on the memorable 5th, he actually reminded me of the first text selected for discourse in the new chapel. Even I had forgotten it. So, having obtained the necessary consent of good Dr Dealtry, the Rector of Clapham, and of the Bishop of Winchester, the Diocesan, I set to work upon the new edifice, thus to be erected as a memento and a beacon in the very midst of you. This beautiful little chapel, for intrinsically beautiful it soon became, was bountifully provided with several painted windows of exquisite workmanship and material at its first opening on Feb. 7, 1846. So soon as I learnt the kind intentions of the boys and their parents, I made it my duty to become acquainted with the history and art of ecclesiastical glass painting, and for that purpose I took a journey to the cathedrals at Canterbury and Bourges, wherein were to be found the best specimens of the craft; nor was the result of the

journey unsuccessful. In due course of time all the windows of the little chapel, to the extent of fifteen, were very satisfactorily filled with painted glass after the best models; and the chequered play of subdued colour added no little to the reverential solemnity of the place. I had no technical knowledge of music myself, but I was well aware of what its effect would be on a community of men or boys, and I betook myself to Bishop, the great organ-builder of the day. In thus providing our place of daily worship with these and other costly adjuncts, I was actuated by the conviction that we are all of us greatly influenced by our daily surroundings, and I wished that the boys should silently but effectually feel that the chapel arrangements suggested on all sides a reverential and loving care.*

If I interpret your feelings and those expressed in the *Monthly School Journal* aright, no part of the school economy was at the time, or in its subsequent memory, more highly cherished than the chapel music. The only part which I could take therein was secondary, but I made it my duty rarely if ever to be absent from the choir practice, and to this expression of care and sympathy I attribute some part of the success. I know not how the whole of this success was effected, but with all my experience, I have rarely or never heard anthems and hymns more touchingly and effectually rendered, whether in cathedrals or colleges, than was frequently the case in our own lovely little chapel. In this way Handel and Mendelssohn, and the great English writers of cathedral music, became familiar to the choir, and to us all. Among the many other benefits derived from this

* Prof. Alexander Herschel wrote in 1895 :—‘ The pretty school chapel is spared, and its old playground entrance enters now into the street. But the chapel itself is converted into a “ Reform Club speech-room,” a raised platform filling up the chancel; but the painted windows all remaining, and some marble memorial tablets in the walls being hung over with baize, and African and Indian “ trophies.” . . . In interior appearance the chapel now, as is natural from the turbulent uses that it serves, is as dirty as a poultry-house or mouldering barn compared to its once organed and benched ornateness.’

institution, there was one which I was particularly gratified to hear from the lips of an 'Old Boy,' to the effect that the Psalms of David were in some cases learned by heart as the result of the chanting. Then, there were the choir suppers and the school concerts, under the guidance of our much-valued choir-master, Mr Boardman. Another result of the practice issued in this, that two from your number obtained musical scholarships at Oxford ; and this record reminds me that I have entirely overlooked the fact, that the school was at times well represented in the University Elevens, and also in the University Eights—honours not lightly esteemed.

But that which has left on my mind the most pleasant and abiding impression is the annual Confirmation in the school chapel. It was the result of the Bishop's own spontaneous suggestion, and for eighteen years in succession he came to us on Whitsunday mornings (the day also was selected by himself) ; he addressed the boys from the pulpit, and then administered the rites of Confirmation and the Holy Communion. I find that about four hundred boys must have been confirmed in the chapel altogether. The Bishop* called it his 'happy day': I am sure it was also mine.

The memory of the orderly decorum not alone on those special occasions, but the memory also of the reverential tone pervading the place on ordinary days, is still to me most refreshing. I hardly know how it was effected ; partly it must have been due to the surroundings, and partly owing, it may be, to the maxim implied in '*si vis me flere, dolendum est ipsi tibi*' ; but it was such as to strike the strangers who came to join in our services. I may here mention that on one occasion the Principal of King's College, Dr Lonsdale, came to see with his eyes what he had heard of with his ears. At this moment I recall the expression of eager

* Sumner.

surprise marked on his countenance, as he looked on the scene before him. 'Tell me how you do it,' said he, after the service. 'Do what?' was the reply. 'Why, what I have seen; how do you do it?' 'By doing nothing,' I rejoined; and then I explained that it was spontaneous and the habit of the place, and could not have been effected by any previous authoritative arrangements. On another occasion, I observed that two elderly ladies frequented our short daily morning service for a considerable time, and I was curious to know the motive. After some little trouble, I succeeded in ascertaining it: 'Oh! it is so quiet,' was the explanation given. Yet there were at the time more than a hundred *boys* in the chapel.

Such, then, were some of the institutions amidst which the boys of the Clapham Grammar School were educated. On reflection, I think they were such as may naturally account for the desire on the part of the 'Old Boys' once again to shake their old schoolmaster by the hand, after the experience and the trials of life, extending in some cases over fifty years. It was in view of this experience and of these trials, that I, of set purpose, devised that plan of education, and devoted very many of the best years of life to the carrying of it out in steadfastness and sincerity. I remember asking one of your number to what he attributed his remarkable position in official life? The reply was, that it was chiefly owing to his application of a maxim, impressed upon him by reiteration at school. That maxim was: 'Whatever you do, do it as well as you can.' I remember also capping the old excuse: 'Please, sir, I did not intend it,' by the remark, 'No doubt, you did not intend *that*, but you ought to have intended the *reverse*.' And there is one of the secrets of the success of the Clapham education.

CHAPTER III

HIS WORK AS A SCHOOLMASTER

Reminiscences of Pupils and Others

GREAT as is the power of self-deception in man, it may be doubted whether any schoolmaster ever believed himself to have been successful in his profession unless he had really succeeded. The boys, if no one else, would have enlightened him on the point. But in my father's case there exists much corroboration on the part of the pupils to prove that his methods of teaching really produced, not only the kindly feeling attested by the 1886 meeting, but the educational results which he expected. In the words of Mr Hemming, 'he was a stupendous fellow, and the making of me, and no doubt of many more.' One of his earliest scholars, the present Dean of Westminster, in an article appearing in the *Nineteenth Century* of March 1884, and entitled 'My School Days from 1830 to 1840,' has described at length the methods of his old teacher, then a young man 'fresh from high mathematical honours at Cambridge, full of fire, enthusiasm and original ability.'

'He, first of all,' writes Dr Bradley, 'at a time when the real study of comparative philology was almost unknown in England, gave us some glimpses into what I may call the science of language; he taught us to try to group together facts for ourselves, and to form laws from what we observed and met. And he did more. He taught us something, at the same time, of the beauty and charm of

literature, old and new. We were still very young boys, even those who formed his "first class," and quite unfit to read continuously such an author as Tacitus. But yet I still remember how, quite early, almost at the outset of our career, he had the courage to introduce us to the magnificent passage that closes the *Life of Agricola*, made us laboriously translate it into English, and I presume, for I can still repeat it almost *verbatim*, commit it to memory; he revealed to some of us for the first time that Latin authors are something more than puzzling sentences in an unfamiliar language. I recall, too, the manner in which, every Saturday, instead of a dull reading lesson, he would summon seven or eight of us to read one after another, in the presence of a roomful of our schoolfellows, some stirring or pathetic passage from the Old or New Testament, or from English poetry or prose, and how we coveted above all things the distinction of being reported at home as the best reader of the week. It was a simple expedient, but at all events it cured us for life of either practising ourselves, or patiently enduring in others a lifeless and mechanical style of reading aloud. Every Saturday also, for a time, we drew without copy, from previous study, a map of Palestine. Physical geography was then in its cradle, the author of *Sinai and Palestine* a schoolboy at Rugby, and of the real configuration of that historic land I fear we, perhaps our teacher, knew little; but the interest which the study of its history and geography inspired laid in one at least of his pupils the seed of a future harvest. . . .

. . . I think that Sir George Grove would date the first germ of his articles on the "Geography and History of Palestine" . . .—perhaps the origin of the Palestine exploration enterprise—to these Saturday maps and Saturday studies. . . . But this was not all; no week passed—and this, it will be remembered, is a period separated from the present by full half a century, during which science has

been slowly winning its way towards obtaining a partial admission into the regular course of an English schoolboy's education—no single week in which we did not receive and eagerly look forward to at least one lesson in natural science. Heat, elementary hydrostatics, mechanics and optics, electricity, and above all chemistry—to something of the elements of all these we were introduced in turn. There was not one among us—at least in our teacher's own class—who could not at that time draw with sufficient accuracy, not merely the proverbial common pump, but a low pressure steam-engine of the day. What is more, we learned, if not any very large amount of scientific knowledge—limited pocket-money and domestic objections to turning our bedrooms into laboratories restrained and froze the genial current of nascent science in our souls—yet a sense of the greatness and importance of the world of science, whose door was at least set ajar for us, a sense that once given us nothing could efface. It became impossible for any one of us to look henceforth on science as a foe. Our favourite literature in our homes was for a time two manuals then in vogue, long since superseded, Mrs Marcet's *Conversations* and Joyce's *Scientific Dialogues*, together with *Philosophy in Sport made Science in Earnest*. Our favourite indoor recreation was the manipulation of a really excellent electrifying machine (as it was then called), manufactured for us by an elder brother, and the reproduction of the chemical experiments which we had seen at school.

‘Meantime we were led through stage after stage of the severe discipline of mathematical study. I really dare hardly say to what dizzy heights we had been conducted by the time that the writer of these pages had reached the age of fifteen years. . . . I felt then, as I feel now, that even the study of mathematics was coloured with the warm glow of the activity and originality of the teacher's mind; and though, from the day in which he wisely and trustfully allowed one of his



pupils to give those mathematical hours to reading by himself, in his own very sorry method, Homer and Thucydides, I never did an hour of voluntary mathematical work, yet I have never felt that any of the time I spent on these studies was wholly wasted. I may add that our teacher, though he must, I fear, have suffered much in the process, read with us, with no inconsiderable effect on our minds, before we had reached the average age of the fifth form at modern Rugby, not only the *Natural Theology* and *Evidences*, and *Horæ Paulinæ* of Paley, but at least the first half of Butler's *Analogy*, a copy of which I still possess, with the date of the year in which I laboriously read and re-read it for him.'

Sir George Grove writes :—

'I had the good fortune to be under Mr Pritchard from 1832 to 1835, and was, therefore, at both Stockwell and Clapham schools. After the latter date circumstances took me into other parts of the world and of this country, and though I am happy to say that I maintained my acquaintance with him to the last, we did not come again into that close and constant contact that I had before enjoyed. I had been at two other schools which were considered good of their class; but with Pritchard the atmosphere was very different. The master was younger and more sympathetic, and full of a wider knowledge than I had before dreamed of; also, he had a great power of explanation and illustration, and took constant interest in his boys. One or two things I had not met with before, and they made a great impression on me. First, the mathematics and the natural philosophy. These were taught in a practical and interesting way, and as connected with common life—not with the abstract world—which made them always fresh. Some of his precepts and examples recur to me almost daily. I never see a lighted candle without recollecting how we were taught that the flame was hollow, and that, therefore, the

place to light a match at was the apex of the flame, where the sides came together, and there was most fire.

‘The teaching of Euclid, too, had a practical turn which was entirely new, and made the propositions realities and not mere abstract things which might be learnt by heart. Impossible with his demonstrations!

‘Another thing was the reading aloud stories from the Bible or passages from English poetry on Saturday mornings. I can never read the story of Naaman the Syrian or of Jacob’s dream without feeling the reality of it all, and recalling the tones of Pritchard’s voice. So, too, in our Latin and Greek translating. He made us *render* the passages as well as *construe* them; and thus we felt that they were about real transactions and people, and reflected the same emotions as our own literature. The passage in the *Agricola*—*Si quis piorum manibus locus*—will be remembered by many of the fellows at school with me, in this connexion.

‘A similar practical lesson was given us by the maps we had to draw, or the diaries or travels we had to write. Geography became a reality, and an interesting reality too. Considering how much I have done since, in connexion with Palestine, it is curious to remember that one of my best efforts at school was a diary of a journey through the Holy Land, with divers incidents got out of a book and thrown into narrative form.

‘In fact, Pritchard had an extraordinary power of teaching, and though other masters in public schools possibly had as much of it, yet in schools of our class it was a great novelty, and has resulted in the high place occupied by many of Pritchard’s pupils.’

In Dr Bradley’s and Sir George Grove’s days it is clear that the master’s ideas of what a school should be were already sufficiently developed, but there had not yet been time for them to take the visible shapes of swimming bath, observatory and chapel. Sir William Herschel, a pupil of a

later date, mentions the 'never forgotten pride' created in him and his schoolfellows by the possession of 'what was in those days a simply lavish provision of fives-courts, swimming baths, gymnasia, a laboratory,' etc. Of these Clapham schooldays Sir William writes :—

'The schoolmaster life of Charles Pritchard has been written by himself in the very "manner which made the man," to use the phrase which often pleased him as a Fellow of New College; and to his old pupils it is delightful to find there described the personal causes which, through him, prepared their "environment" for them, as well as the part they, as a school, took in the growth of modern England. His intense desire was not so much to teach a stock of facts as to put his boys into possession of clear ideas, which should make the facts inseparable parts of their intelligence for ever after, so that the ideas set the imagination working in safe directions, while facts were abundantly supplied by way of food.

'In a letter to the father of one of them he says :—

"One day I was showing the boys some of Faraday's beautiful experiments for the establishment of the fundamentals of electricity, and the lad shouted for joy. The contagion spread and his young companion broke forth also."

'It was this joyous grasp of a demonstration which it was his chief delight to impart, since it was indeed the very secret of his own large mastery of science, and of his familiarity, not quite so great, perhaps, with classical literature. It certainly lent power to his apprehension of the divine truths of theology, and to his instructions in them, though to us boys he was always in his gravest and, perhaps, most dignified attitude when engaged in sacred subjects.

'From a self-made man of his stamp the doctrine of Perseverance was naturally made much of. It was one of his favourite subjects, especially in relation to genius. It is curious to see how the mathematical mind expresses its

conception of the interaction of moral qualities. He put it once thus :—

“I believe it is a law of God that success varies as Perseverance $\mid m \times$ Genius $\mid n$, (m) being considerable, and (n) being unity. It is glorious to see how the knowledge of truth dawns out of a dim twilight into brightness in an atmosphere of perseverance.”

‘Nevertheless, if Pritchard’s system had any distinctive fault it was in making the fruits of knowledge accessible without quite enough of climbing. That, however, was the unavoidable result of the excitement then working in men’s mind, who, to their own surprise, found themselves in possession, as it were, of the mountain passes into territories of hitherto inconceivable beauty and fertility. It would not have been human for an enthusiastic nature like his to treat his subjects in the cold statistical manner which marks so many modern, as the vague didactic manner did almost all the older schools. His was, in fact, the happy time for any teacher who could grasp the situation and throw himself into it *con amore*. It is his great merit, greater even than anything he did for pure science in later days, that he seized the opportunity and turned it to account with a practical shrewdness all his own. He lacked, indeed, that rare gift, the crowning glory of the ideal English schoolmaster, by virtue of which he becomes the hero and the model of his boys ; but he came very near attaining even this blue ribbon of his profession, by a certain disregard—a disregard which was anything but contempt—of all personal considerations of the kind, in his earnest pursuit of any object. Some of us may remember how we heard one day of his having met Z—coming back from an exeat to Putney with a cigar in his lips, against all promises to the contrary ; and how we also heard with no surprise, but without much sympathy with the master, that he had plucked the cigar out and smudged

the ashes on the offender's face in a passion of righteous indignation. We did admire the courage of the act, for Z—— was a giant; but it was acts of roughness like this that just lost him the prestige which we were always on the verge of conceding to him. It was not ill-temper, but sheer energy overleaping itself, a kind of boisterousness that showed itself in many ways, even in his delivery of his laboratory lectures. Here he had the habit of tempering it with a touch almost of penitence, when, with some slow words of unmistakable sincerity, he would carry us with him into a tribute of admiration and gratitude for the wisdom which had ordained what he was only displaying to us. It was this unaffected consistency, with the natural inconsistencies of humanity, that after all made us love him and makes his memory a common pleasure to us.

‘He could not, of course, endure “railing accusations” against science from any quarter, least of all from his own theological friends. So far back as 1863, writing to Sir John Herschel, who was just bringing out a new edition of his *Outlines of Astronomy*, he says:—

“The —— had an article singing ‘jubilate’ over the astronomical error (just then determined) regarding the sun’s distance. ‘Four million miles out! Astronomers guess, after all. Down goes astronomy!’ Now, in your note on this emendation of the sun’s parallax, can you add a word to remove such nonsense? I have measured the thickness of one of my hairs, and find that the correction now made in the angle means one hair at (a distance of) 125 feet, or a sovereign at eight miles!”

‘The suggested illustration appeared in the new edition of the *Outlines*, and has ever since served as the typical illustration, in popular lectures, of the relative minuteness of astronomical errors.

‘An instance of this way of looking at scientific things

from a religious standpoint occurs in a letter he wrote (October 1846) at the time of the discovery of Neptune :—

“I remember well how your words about the new planet thrilled through me at South(ampton). In the words of a better man than either of us, and on a better subject, ‘I thanked God and took courage.’ . . . ”

‘I have already spoken of his constant reference, as a man of science, to the Giver of all knowledge. The great struggle between science and faith, to which he devoted so much of his zeal and eloquence in later days, had not acquired its prominent importance while he was teaching at Clapham. The change in this respect has probably been endured by few of our generation more robustly than by Pritchard’s pupils, trained as they were, by his method and personal example, to trust themselves fearlessly to the delights of research, while their religious faith has been preserved warm, vigorous, and even militant like his. For he enjoyed the combat as a soldier does, full of faith in his leader. Assuredly, he does not over-estimate the “abiding impression” of the Confirmation service, or of the usual worship in chapel.’

It was not only upon the inexperienced minds of the boyish worshippers that the school services produced a deep impression. Mr James Knowles, editor of the *Nineteenth Century*, writes as follows (27th May 1894) :—

‘Although, when I was “little more than a boy,” your father admitted me to his friendship in the old time of his Clapham Grammar School days, I was never his school pupil (I wish I had been!). I came to know him from attending that pretty little school chapel which he had built, and of which he was so fond, and out of that pastoral relationship grew my acquaintance with him in his observatory and garden, and ultimately my friendship with him of so many years’ duration.

‘The chapel, the garden and the observatory, each and

all of them he made 'full of voices,' which I have never forgotten to be grateful for. Even now, I can almost see the pictures which Sunday after Sunday he painted in words so vivid and yet so simple, that we were carried back in the spirit to the very places and times he was reviving. He had a marvellously strong and embodying imagination, which made the Bible stories actual facts and not mere ancient records, and set us, as it were, back into the real presence of even the greatest of the actors in them. Then again, I remember how he would pace for hours up and down the walks of his garden, bordered on each side by all sorts and kinds of plants and flowers, whose names and qualities and virtues he made texts for endless illustrations of mental and moral questions such as he loved to discuss without end, and always without cant or boredom or affectation and in perfectly common sense, wholesome and yet enthusiastic ways. Again, and especially, I recall the nights in his observatory when he brought all the wonders of his material heaven into one's mind and heart as well as to one's eyes, his enthusiasm carrying one, as in a chariot of fire, up to and beyond the highest.'

Still more striking is the testimony of Dr Perowne, now Bishop of Worcester, who thus describes the effect produced on him by the school services and their founder:—

'It was here (at Clapham) that my acquaintance with him began, some forty years ago, when I was residing in King's College, London, where I held at that time a theological lectureship. It came about in this way. Happening to see in a bookseller's shop in Fleet Street, much frequented by Cambridge men, that he wanted a clergyman to help him by preaching a sermon on Sunday afternoons in his little school chapel, I offered my services and was accepted. So began a friendship which ended only with his death. That chapel was the pride of his life. He had built and embellished it. Every detail was studied with loving care. The windows were filled with stained glass, the design and execution of which he super-

intended himself. The organ was constructed under his direction by one of the best builders of the day. The choir was carefully trained. Beside the masters and pupils of the school, there was a small congregation gathered from friends in the neighbourhood, who came there attracted by the reverent beauty of the service, and by the broad and manly utterances of the headmaster, rooted himself in the faith, but able to sympathise with the doubts and perplexities of others, and especially of the rising generation.

‘One Sunday in the year was always a great day at Clapham. Every Whitsunday the Bishop of Winchester (Sumner), at his own desire, held a Confirmation in the little chapel. It was a day much to be remembered. The solemn hushed stillness of the service, the wise and loving words of the Bishop, the reverent and devout demeanour of the candidates during the administration of the rites of Confirmation and the Holy Communion impressed all who witnessed them. The Bishop called it his “happy day.” “I am sure,” adds Pritchard, in speaking of it, “it was mine.” As I learnt to know more of my friend, I observed with what diligent care he prepared his pupils, praying, as one of them bears record, “for and with each one” before he presented them for Confirmation. To many it was the turning point in their history.

‘Those days were to me very precious. Sunday by Sunday I attended the service, and every Sunday for some years I remained after the service for the night. In the summer evenings Pritchard would take me into his garden, for every flower of which he had an individual regard—and that was one link of union, for like him I loved flowers—and there, walking leisurely to and fro, or lying on the grass, he delighted to speak of the beauty and the wonder of Nature, and the marvels of Divine order in creation; or he would discuss the great problems that lie at the roots of all life; and the freshness and originality of his mind were a healthy and

bracing stimulant to thought. At other times, on bright, cloudless nights, he would show us in his telescope the moon and the stars, and tell us the fascinating tale of their history and structure.

‘The winter evenings were spent in his study; and there he would take down some book from his shelves, and we read together Plato’s glorious myths in the *Republic* and the *Gorgias*, or his *Phædo* or *Second Alcibiades*, or we turned a page of Cicero or Augustine; or some modern author beguiled us, Coleridge, or Wordsworth, or Tennyson, or Julius Charles Hare; for we were both of us Cambridge men, and had the same sympathies and the same tastes in literature, and the same convictions in theology, though he was many years my senior. We both had the greatest admiration for the broad and masculine theology of men like Julius Hare and Thomas Arnold, and Thirlwall. We both of us recoiled from what appeared to us to be the retrograde movement and the un-English disingenuousness of the Oxford Tractarians. We venerated Luther and thanked God for the Reformation, and we regarded the avowed attempt “to undo the work of the Reformation” as nothing short of treachery to the Church. Pritchard’s love for Cambridge, and especially for the noble college where he had received his training, was a passion. Long years after, in spite of his adoption by the University of Oxford, and though fully alive to all that Oxford had done to show her sense of his eminent services, and though truly grateful for the recognition, his heart would go back to his Cambridge days, and of all the honours he received in later life, none, I verily believe, was so dear to him as the Honorary Fellowship conferred on him by his old college.

‘His wonderful power of inspiration as a teacher has been testified by several of his pupils at Stockwell and Clapham. No teacher ever surpassed him in the clearness of his methods. He would make the most abstruse subjects

intelligible and full of interest. I used to say to him sometimes, "If I had had you to teach me, I should have understood mathematics, but Cambridge mathematical books inspired me with nothing but aversion." He said he was not surprised, and did not hesitate to declare that certain well-known university text-books were disfigured by the most extraordinary blunders. For men naturally disposed to mathematical studies, the teaching ordinarily given might suffice, but for those to whom the very elements of mathematics presented difficulties there was very little help. The books were badly written, the diagrams badly drawn. In the lecture rooms we were expected to understand mechanics without ever seeing a system of weights and pulleys, hydrostatics without even the model of a pump, optics without a microscope, a telescope, or even a lens. As for natural science, it never came within the possible range of our studies in my day. Pritchard's method of teaching was the very reverse of all this. One of the first things he did when he became master of the Clapham Grammar School was to establish a laboratory, and gradually furnish it "with all apparatus necessary for the elucidation of chemical and physical phenomena." In a few years after an observatory was added to the other institutions of the school. I heard him once say that he hoped the day would come when every manse would have its microscope in the study and its telescope on the lawn. This was his method, the only rational method of teaching by helping the understanding through the eyes. In a letter to me he says :—

"A lecture last night from Sir H. Roscoe on technical education, or rather on the introduction of the study of Nature into all education. *Voilà !* what I did sixty years ago. Things must come to this when mediævals die off, if ever they do. Certainly children of six months begin to draw ; savages are great at imitative arts. My boys were compelled to draw for two hours weekly till the age of seventeen. The

change required, or *a* change required in education is to insist on boys (and girls) learning intelligently, and learning to *express* intelligently the great elementary principles in a branch of Nature—knowledge or language. I could give you Latin subjunctive and heaps of such things in a few lines not to be mistaken or forgotten. I could give you the whole of elementary optical formulæ *in words* and ideas never to be misunderstood or forgotten. All algebraic or symbolical expressions ought to be translated into words in the mind.”

‘His many-sidedness was remarkable, and the breadth of his mental grasp. At Cambridge, it is true, he devoted himself almost entirely to mathematics, his only excursion, as an undergraduate, into theology being the study of Butler’s *Analogy*, which then formed a part of the examination at St John’s, and which he thoroughly mastered. He often expressed to me his sense of the great value of this study, and his regret that Butler was no longer a text-book in his college. It had so wrought itself into the texture of his mind and thought that it coloured all his way of looking at theological questions. I have sometimes thought that the strong *conservatism* of some of his opinions, notwithstanding the reverent freedom with which he handled most questions, was due to the influence of Butler. He knew pages of the *Analogy* by heart, having learnt them ensconced in the branches of a weeping willow which hung over the Cam. He has also expressed his indebtedness to the sermons of Professor Blunt, afterwards gathered into a volume on the *Undesigned Coincidences of the Old Testament*; and to the sermons of Julius Hare, which contributed greatly to form the theological bias of his mind; and “if to these,” he says, “I add the writings of Coleridge and those of the accomplished and large-minded Isaac Taylor, I think I should nearly exhaust the authors who, during my undergraduateship, laid the foundation of my theological predilections.”

CHAPTER IV

LIFE AT FRESHWATER, 1862-1870

By his Daughter, Rosalind Pritchard

INTENSELY interested as my father was in the training and development of youthful minds, which had been his pleasant task at Clapham, the time had come when he found that a pause was necessary. His life hitherto had been one of almost unceasing occupation, and the trammels of routine in paths, however congenial, began to be burdensome.

The management of the school at Clapham had been a pleasant but an absorbing task, and one that did not leave sufficient time for the pursuits towards which his aspirations and tastes inclined. A visit to the Isle of Wight inspired a longing for a time of quiet enjoyment of the country, and of uninterrupted study. Accordingly, the school at Clapham was transferred to other hands, and, in 1862, my father lodged his belongings in a house owned by the Rev. Mr Bowen, father of Lord Justice Bowen, at Freshwater, in the Isle of Wight, during the building of his own house, Hurst Hill, which was to become his residence during the seven following years.

An admiration for Nature, so enthusiastic and spontaneous as to be inspiring to those around him, enabled him to appreciate and rejoice in his beautiful surroundings. The view from his library windows, overlooking the Solent and Hurst Castle, was his especial delight. He gloried in

the luxuriant vegetation of a country where climate and soil alike combined to render aid from human hands scarcely necessary. He watched the planting of every tree and shrub, and was never tired of noting their rapid growth to beauty.

But the seven years in the Isle of Wight were not years of leisure. The pleasure he experienced in his garden and in the natural beauties of his surroundings formed only an agreeable accompaniment to a life full of many intellectual occupations. The best of my father's theological work was accomplished during this period. His scientific studies were pursued, and he was able to ascertain in what direction his life's work most usefully tended. There is no doubt that his inclinations led him, as will presently be shown, towards theology. A longing to testify to men his deep-rooted faith and convictions was the mainspring of his desire to join in the work of Christian teaching. But while an opening in this direction had yet to be sought, his scientific career was already begun. In the year of his leaving Clapham he became secretary to the Royal Astronomical Society; and with the duties of this important post, and the optical researches on which he had for some years been consulting with his old friend, Sir John Herschel, he might have been thought to have provided himself with occupation amply sufficient for a man well past fifty, who had been hard at work, without intermission, since boyhood. All through his life the study of astronomy had formed one of the chief occupations of my father's leisure hours. The astronomical instruments which had been in constant use at Clapham were transferred to Freshwater, where two small observatories were equipped, and observations pursued by him with great zeal. He very frequently attended the meetings of the Royal Astronomical Society, of which he was a fellow, and as I have said, secretary, and subsequently vice-president and president.

His repute as an astronomer was well established, although he professedly was but an amateur. So absorbed was he when at work in his observatory that meals would frequently pass by unheeded, and the reminding messenger was only regarded as an irritating interruption, to be forgotten as soon as the reminder had departed.

Chemistry, too, had always possessed great fascination for him. He formed a small laboratory, in which he interested himself in experimenting. My own remembrance of these experiments is vivid, as he occasionally held demonstrations for our benefit. These were frequently of so explosive a character that we children took up our position behind a curtain, ready to withdraw our heads when operations became alarming.

But scientific pursuits alone could not long content my father. Soon he entered into the field of active discussion on questions of religion, when Bishop Colenso, in 1863, struck consternation into the hearts of many churchmen by his book on the Pentateuch, which questioned the veracity of so much narrated in this part of the Scriptures. Dr Colenso's reputation as a man of science, and as a distinguished theologian, made the refutation of his contentions no easy task, but one which my father felt it his duty to undertake.

The facts that Colenso had been a member of the same college at Cambridge as himself, and that his career, up to a certain point, had been similar to his own, were of special force in inciting my father to answer arguments which he regarded as unworthy of an education at Cambridge, and more particularly at St John's College. He therefore set himself the task of refuting the contentions of the Bishop, and proving them to be untenable by the light of science and theology. His arguments, written in the form of a letter, were published by Bell & Daldy.

In the introduction to this pamphlet he thus ex-

plains his reasons for undertaking the defence of the Scriptures:—

‘Our career in life for some time ran nearly parallel; both of us gained very nearly the same academical distinctions; both of us have written books once, more or less adopted by our university, and we both of us attained to the honour of a Fellowship in the same noble college. It is this last circumstance which, perhaps, has weighed with me more than any other; not so much in my determination to sift your arguments as best I may, as in the adoption of the present form of communicating the result of the investigation. I have spoken of our college, for no loyal member of that ancient and religious foundation can forget how it trained, and still cherishes the memory of learned and good men, such as Henry Martyn, and Blunt and Selwyn; men who have devoted or hazarded their lives in defending at home, or in preaching abroad to the heathen, that faith which, to our great amazement, you now teach as resting on no secure and historical basis. Not that I would arrogate to myself the office of defending the fair fame of the venerable society to which we belong, but I have set myself the task of exposing what I believe to be the fallacies of your book, partly from the impatience which all men feel while a stigma remains upon any object of their deep regard, and partly under the hope that I may incite some other men of greater ability to extend and complete the arguments which I have here briefly, and with intentional brevity, commenced.

‘Then there is another motive which has induced me to come forward. I greatly fear that, through an infirmity common to minds half informed, your book may still further encourage the belief or the suspicion that there is some necessary but ill-defined connection between mathematical or natural science and scepticism regarding the historical value of the Sacred Record. For it cannot be forgotten

that Dr Colenso is, or has been, a man of science, and it cannot be unknown that the Bishop of Natal teaches very large portions of the Pentateuch to be historically false. As one, therefore, who has passed much of his life in the pursuit of scientific learning of various descriptions, I wish, so far as in me lies, to vindicate the compatibility of scientific acquirements, with a devout but intelligent belief in the historical veracity of the Sacred Scriptures.'

The argument ran to forty-two pages, and its convincing nature called forth expressions of gratitude and admiration from men of science and churchmen, both known and unknown to the writer. One of the testimonies he valued most came from the Bishop of Winchester, Dr Sumner, who, writing from Farnham, says:—

'MY DEAR MR PRITCHARD,—I have read your pamphlet with the deepest interest. I know not whether I ought to speak so plainly in writing to you, but I cannot refrain from saying that, in my judgment, it is incomparably the best production which Bishop Colenso's book has yet called into being. In tone and spirit, as well as in the management of details, it leaves nothing to be desired. And this is the more observable as by far the larger number of the many replies to that unhappy book which I have seen, although not wanting in talent, are greatly wanting in the calm and serious spirit which you have maintained throughout. The subject is too grave for sarcasm and light treatment, however the offender may have merited them. The publication of such a volume by such a man is to me a greater wonder than any of those to which he refuses to give credit.—I am, my dear Mr Pritchard, yours ever,

'C. WINTON.'

Bishop Sumner was an old and abiding friend of my

father's, who never failed to find his way to Hurst Hill when his duties led him to the island. The Colenso incident also led my father into correspondence of gigantic proportions with persons of all classes and opinions. One interesting discussion was with the Astronomer Royal, one letter of whose ran as follows:—

‘ ROYAL OBSERVATORY, GREENWICH,
‘ *June 19th, 1867.*

‘ MY DEAR PRITCHARD,—As you are engaged in subjects which may lead to one to which I have given much attention—the character and results of Colenso's work—would it at all interest you to see some notes which I drew up to assist my own memory—eighteen pages of MS.? Pray make no scruple in rejecting this.

‘ I send by book post the MS. which I mentioned to you—review of Colenso on the Pentateuch. You will perceive that it is a part, in fact the end, of a longer essay. It is perhaps a little more finished than the earlier parts, and it embodies my leading ideas on the formation of the Pentateuch. If you wish to see any more of the series, you shall have it.

‘ Now as to your question on the scientific difficulties attending a *literal* interpretation of the earlier chapters in Genesis, I say without hesitation, and shall always be ready to say, when it seems needful, that they are insuperable. I say also that the two accounts of creation are irreconcilable. And I am very confident that nothing will explain this except the supposition that they have been derived from two different countries, say Egypt and Assyria.

‘ How legends of this class can have arisen, I can hardly say. But certainly with a reverential and religious feeling, and looking at them as an educated modern, I yet regard them with much reverence.

‘ Several weeks ago, when I met Dr Miller on Blackheath

he asked me if I had seen an Oxford book reconciling modern astronomy with the Bible. I told him I had not, but the writer had undertaken a risky task.

‘This, I think, meets your general questions.

‘Now as to your case of A and B.

‘I state that the Christian religion (the only one that I recognise) is in no danger from the investigations of science.

‘There I stop. If anybody chooses to append to it “belief in every word of the Hebrew Scriptures,” on him be all the attendant difficulties. I quote (*memoriter*) from Paley, “To make Christianity answerable with its life for the obscurities of the Hebrew Scriptures is to load it, I will not say with great, but with unnecessary, difficulties.”

‘If you think that there is in Dr Miller’s mind a misunderstanding sufficiently serious to require it, I will write to him a very few words, explanatory, not controversial.

‘I have Herschel’s Schiller’s *Spaziergang*, but have not read it. I will take it off its shelf.—I am, always, yours very truly,
G. B. AIRY.’

Not satisfied to serve the cause of religion only in controversy, such as that which the correspondence with Colenso called forth, my father, full of active zeal, observed with regret the want of religious facilities in the surrounding community, too scattered for the ministrations of the one parish church at Freshwater, many miles distant from the poor homes at Totland and Alum Bays. Possessed of a meadow within reasonable distance of both these places, my father felt that here was a spot which might be utilised as the site of a place of worship, with great benefit to a large number of the population. In imagination he saw the little church

already erected, and affording a pleasant prospect before the windows of his library. The idea was no sooner conceived than he hastened to put it into execution, and a church of simple but effective design was projected on paper, my father undertaking to raise the money himself, and to superintend the completion of the scheme.

In 1869, as quoted by Sir William Herschel, he wrote :—

‘I am about to imitate the old German students in a peripatetic lecture on the sun’s constitution and the (recent) eclipse, going from town to town to collect money for a new church. The people are in gross darkness, and I have promised a good round sum, which I must collect in this way, if I can.’

He laid the plan before the Bishop of the Diocese and the Rector of Freshwater, who gave their consent; and very speedily the necessary funds were almost collected. It was, therefore, a matter of much disappointment that the cherished plan had finally to be abandoned owing to difficulties which arose relating to the proposed incumbency; difficulties which had to be faced again and overcome some years later, when the petitions of an increasing population could no longer pass unheeded. Then a little wooden church was erected in which my father took much interest, helping in the simple services and with the music, himself sometimes attending the choir practices, and encouraging his family to assist.

He was indeed ever ready to help those around him, as a letter from Mrs Cameron, counting on his co-operation in a scheme to extend intellectual light amongst the people, shows. She wrote :—

‘MY DEAR MR PRITCHARD,—I did not know, until I heard last evening of some children having been made happy, that you were now amongst us, or I should have written earlier to claim of you your hearty *co-operation* in the work

now ready to bear fruit—our Freshwater Reading-Room and Literary Association, as it will endeavour to be. . . . Now all our people spend all their leisure hours in the public-houses which abound to entice and to ensnare; whilst there is *not one* reading-room, one spot of rest, where they can, after their work is over, find innocent repose and turn their leisure to account. . . . I think a reading-room is a lay church. . . . I hope you will seal the success of the rooms by your personal presence. I hope you will speak and lecture—speak often, lecture by way of a great treat. We can but hope. I trust we shall open on Saturday next.—Yours always truly,

‘JULIA M. CAMERON.’

Mrs Cameron, so well known to fame through her photography, lived at some little distance from Hurst Hill. She was a quaint personality, full of intelligence and originality, and a very great admirer of our neighbour Tennyson, of whom she made several admirable portraits, despite the fact that he was somewhat embarrassed by admiration at close quarters, especially when it emanated from one of the gentler sex. Farringford, Tennyson's residence, was the nearest habitation in constant occupation, and between the poet and my father there grew up a very sincere friendship and regard. Both devoted much attention to the study of contemporary thought and the tendencies of the times, and they found interchange of conclusions and opinions very interesting.

During my father's residence at Freshwater, he frequently occupied the pulpits of neighbouring churches, and occasionally acted as *locum tenens* for one of the clergy. It was during this period of unofficial life that he preached those sermons at Cambridge and before the British Association which gave him a recognised place amongst leading theologians.

The sermon delivered at Nottingham before the British Association, in 1866, was considered by himself, and I think

truly, to have established his position as a preacher. Indeed, it accomplished more than that for him. It was an epoch in his career. Writing to my brother Eric some twenty years later, and after the award of an honour received in his latter days, he says: 'I owe my position now to my sermon at Nottingham.' Strangely enough, it was published only at the request of one of the congregation present at St Matthew's, Nottingham, where the sermon was delivered. The gentleman in question gave his own account of the incident in a local paper. I have the cutting of this little article, which is marked, in my father's handwriting, 'sent by I know not whom':—

'But the sermon—that was one indeed! Mr Pritchard took rank in it as one of the reconcilers of the largest and profoundest scientific thought of the age with soundest orthodoxy. The deepest doctrines that scientific men in the pulpit used to avoid, and the non-scientific preachers used to bewail as denied or destroyed by science, were treated of in a manner most clear, earnest and eloquent. So excited was I, that, though an utter stranger, I sidled through the departing crowd at the close, up to the chancel, in hopes of "accidentally on purpose" meeting the preacher, and did so; and there and then, as a stranger, yet friend by Freemasonry of the British Association, expressed a hope that it might be printed. Of course there was hesitation. "It wanted a good deal doing to it." "The thoughts were in everybody's head." "Well! I will do what I can with it." So it is to be done, and I trust my readers will peruse it, and see what the British Association does on a Sunday.'

Sermons thus printed 'at request' too often, it is to be feared, find no readers, with the exception, it is to be hoped, of the persons at whose request they are printed. Very different was the fate of the Nottingham sermon. Its effect on two earnest and influential minds is thus described in a letter from Dean Hook, written several years later, 11th Feb-

ruary 1870, on my father's election to his Oxford Professorship:—

'You, a perfect stranger to me, send me a printed sermon. Why you should even have thought of me would perplex us if we did not see the convergence of a chain of circumstances leading to the present happy result. I send your sermon (as I send books that interest me) to the Chancellor [Hatherley]. He is wonderfully struck with it; alludes to it in a publication* of his own, and determines that the author ought to have a *locus standi* in the Church—but where? He feels, even more strongly than I do—and I feel very strongly—the impolicy of placing a man of middle age in a parish if he has not been habituated to pastoral work. . . . The Chancellor commissioned me therefore to tell you that, although he made no promises, he had you on his list for a stall.'

The last part of the letter alludes to the anxiety which my father had expressed, at least as early as 1866, to apply himself, after his few years of comparative repose, 'to the permanent duties of some pastoral charge.' To this project he long clung, in spite of the persuasion of his new friends, who assured him that he was meant for other work, that, in Dean Hook's words (20th November 1866), 'we can get preachers and pastors, but not philosophers.' Out of the correspondence thus begun, there grew up between my father and Dean Hook a warm and constant friendship, the more remarkable when it is considered that the friends never met till one was approaching seventy and the other sixty.

'I rejoice to find,' Hook had written, commenting on the Nottingham sermon, 'that my mind has often run in the same groove as yours—set agoing by Butler.' The influence of Bishop Butler, the object of my father's lifelong reverence, is indeed apparent throughout the sermon, which had for its subject, 'The Continuity of the Schemes of Nature and of Revelation,' and which was noticed by others besides divines.

* *The Continuity of the Holy Scriptures*, 1867.

In its published form there were notes appended to it, one dealing with the subject of Darwinism, then in the thoughts of everyone. My father laid stress on two arguments, as to which much more has since been said; * first, that so complicated a structure as the human eye could not have been improved to its present shape by any series of *accidental* variations; and, secondly, that there are conclusive physical reasons for thinking that the earth cannot have been in a condition to support the life of organised beings for anything like the hundreds of millions of years demanded by geologists and by Darwin himself for the denudation of the one district of the Weald. On this point, he used a somewhat curious argument, to the effect that if, as physicists have asserted, the length of the day is increasing at a calculable rate, owing to the friction of the tides, then, within the limits of time required by Darwin for the evolution of present forms, we shall find that the day must have been less than a second long. To the pamphlet, Mr Darwin replied in the following characteristic letter:—

‘DOWN, Oct. 12th (1866?).

‘MY DEAR MR PRITCHARD,—I have read with much interest your sermon, with its appendices, and I thank you sincerely for having sent it me.

‘I should be a very cross-grained man to object to a single word that you have said. You pay me the most elegant compliments, and attack me with much spirit and force. Even if I could you would not thank me for making a long defence; but I may make two remarks. When I refer to the extremely simple eyes of the *articulata* (*i.e.*, insects, spiders, etc.), you translate this into the human eye*. Should there be a second edition, I hope you will correct this, for I have always spoken of the human eye as the pinnacle of difficulty.

* See page 183.

‘You speak of the necessity of various parts of the eye changing simultaneously in order that it may become adapted for even slightly changed work; but many a short-sighted person can see an object distinctly at a distance which renders the image confused to others.

‘What a very curious case about the increasing length of day! I have that profound respect for mathematics which profound ignorance gives, but I cannot help observing that when applied to uncertain subjects, such as geology, it gives as uncertain results as geologists arrive at by other means; for instance, how Thomson and others differ about the thickness of the crust of the earth and the rate of cooling.

‘My son George has been much interested by your sermon, and begs to be very kindly remembered to you. —With my best thanks, pray believe me, yours very sincerely,
CH. DARWIN.

‘That is a very foolish episode of mine about the Wealden, and was struck out in the later editions.’

Another eminent man of science, to whom the sermon was sent, Professor J. C. Adams, the discoverer of Neptune, wrote, ‘I cordially agree with most of your remarks;’ but dissented, for reasons which at the present day need not be repeated, from my father’s conclusions as to the change in the time of the earth’s rotation.

In the following year, 1867, my father was invited to deliver the Hulsean lectures at Cambridge. During the time of their delivery he took up his residence, with his family, at Cambridge, where he much enjoyed renewing old friendships, and being in the midst of intellectual life. What he thought of his performance may be gathered from a letter to Mr Huggins. His subject, it may be remarked, was ‘Analogies in the Progress of Nature and Grace.’

'I have just sent off the last corrections of the proofs of the four Hulsean lectures. I have done and produced my *best*, and let any man who has so done thank God for health and strength, and will and opportunity to do it, whatever that best may be. I have greatly enjoyed my subject . . .'

He received so much kindness during his stay at Cambridge that he looked back on this time as one of his happiest memories.

Despite the reputation he had by this time attained as a preacher, my father himself still hoped to fill no higher office than that of parish priest. A letter from Sir Frederick Pollock shows, however, that those who knew his powers felt that he was fitted to adorn a more influential position.

'HATTON, HOUNSLOW, W.,

'*Tuesday, 16th Oct. 1866.*

'MY DEAR SIR,—I wish I had the custody of the "great seal" for a few days. It would give me such pleasure to ask you to choose from the vacant livings in the gift of the Crown in *that department*. There was a clerical astronomer in Ireland of whom it was said he might thank his *stars* for a bishoprick. I think *your stars* ought to command more than you own to be aiming at. As I am out of office I may venture (though November be hastening here) to ask you to come and see me. It is manifest (to me, at least) that we have much to talk about. . . . Most sincerely I am more obliged to you for a copy of your sermon than I can express. I write at once. . . . I entirely agree with you on the subject of —'s remark and Darwin's book. It seems to me gratuitously to assume that any form of created being may be gradually changed into any other, provided you give time enough for the metamorphosis; and as you have unlimited time before you, and behind you also, you may

take as much time as is required to change an elephant into a cassowary, or rather to derive *both* from a common origin and cell. There are solid and deep-rooted objections to this theory, derived from considerations too large to be more than alluded to here in this present letter, but there is no *fact* in Nature which affords it the least encouragement. Natural history has been the subject of observation for above 3000 years, and of *study* above 2000 years, and nothing is to be found as a *fact* in favour of it; species become extinct, but no *new* ones are discovered. Darwin would say the observation of ten or even 100,000 years goes for nothing; nature takes one of these steps only once in a million years.

‘It is possible that my philosophical views may be prejudiced by the notion that Darwin’s theory (though not *atheistically*) is entirely opposed to any form of revelation—which the actual physical discoveries of any kind, I think, are not. No Christian takes his notions of astronomy from the Bible, nor of natural history (for, no doubt, hares and rabbits do not chew the cud!), and I should not quarrel with anyone for doubting whether we ought to take our notions of archæology or even cosmogony from the Bible.

‘It may be that revelation is intended to teach only what cannot be known without it, and leaves the ignorance of the world on other matters just as it found it . . . indeed, sometimes adopting it as the only mode of becoming *at all intelligible* to us. Forms are used suited to our ignorance and giving us a notion, no doubt true, as far as it goes, but not giving the whole truth, which at present is beyond our comprehension. If Joshua had used language that would have satisfied the Inquisition that Galileo was right, he would have been utterly unintelligible to the people of Israel, and to be understood must have put forth Herschel’s *Outlines of Astronomy*. . . . Take the mightiest and most sublime of

physical creations which our senses can perceive or our imaginations grasp—where is the “continuity” between one nebula and another in the heavens. (See Herschel’s *Outlines*, sec. 868.) Look at the Dumb-bell Nebula—the great Spiral, the great Nebula of Orion—and say what continuity is to be found among them. Do they come from a *cell*? It would take a man’s life for light itself to go from star to star. We see them by a salvation of light that left them ten or 20,000 years ago. Where can I find most readily anything about the altered length of day? It is new to me quite.—Your sincere friend,
F. POLLOCK.’

Dean Hook, writing on 15th April 1869, questioned his wisdom in wishing for pastoral employment. Yet in this wish he persisted, even after his friend, Lord Hatherley, had actually promised him a canonry, should one fall vacant.

While immersed in special studies, my father always took the keenest interest in contemporary events, keeping touch with all that stirred the minds of men in his generation. One of the most interesting episodes during this period of his life was the formation of the Metaphysical Society.

Of my father’s share in this movement, Mr James Knowles, writing on 27th May 1894, says:—

‘When he came to stay with us at Clapham Common from the Isle of Wight we used to resume our old talks of the school days about theology, physics and metaphysics, and it was on one occasion, in 1868, when he was fellow-guest at “The Hollies” with Tennyson, that the bard joined in so often and so much that we made a sort of triangular duel, and that the thought occurred to us of getting up a society to discuss such questions formally and scientifically, which resulted in the formation of the Metaphysical Society. It was the fact of your father, as a great scientific man, agreeing to

join the great poet and "a man in the streets" like myself, which gave me the courage to get together that remarkable assemblage of men of which you have heard so much. Your father did not come much, indeed, scarcely at all, to the meetings, though he took great interest in following the proceedings. This was, I think, partly because of residence so far off from London, but partly also because, although admirable and delightful in a dialogue, I do not think he was ever so much at home or at his ease in a talk with several people. He was always a wonderfully shy and *modest* man, and rather hermit-like in his social relations with the world. Moreover, I think, the main subject of interest with him, at any rate one of his most frequent subjects of talk with me, and of much of his writing, was the reconciliation of science with the Bible. It was for the light it might possibly throw upon this that I think he joined in the formation of the Metaphysical Society, which, as a matter of fact, did not go much at any time into that question, except quite indirectly.'

In the *Nineteenth Century*, August 1885, Mr Knowles has given a similar account of the foundation of this celebrated society, which included among its members men of such diverse opinions as Cardinal Manning, Professor Huxley, Mr Froude, Mr R. H. Hutton and Sir John Lubbock. It lasted nearly twelve years, in spite of Mr Froude's saying that, 'If we hung together for twelve months, it would be one of the most remarkable facts in history.'

Attendances at the meetings of this society and those of the Royal Astronomical Society called my father to London at irregular intervals. These occasions proved not only intellectually refreshing to him, but afforded opportunities he very much enjoyed of visiting Covent Garden Market. From thence he usually secured some novelty in horticulture, and never left without one of the Covent Garden sorted salads, which he always regarded as unequalled. He was quite a

well-known character amongst the old ladies who plied their trade in the market, and was always greeted with a smile, in anticipation of the banter which invariably accompanied the purchases.

We children always looked forward to the return from London. We were never forgotten. The remembrance sometimes took the form of some new mechanical toy, or small trinket, but sweetmeats were most usual. Astonished indeed would those only acquainted with the graver side of his character have been, could they have witnessed the performances which marked the bestowal of these dainties. Competitions of the most varied nature, but always grotesque or fantastic, marked the occasion, and I have seen tears of mirth roll down my father's cheeks as he awarded the prizes to the eager little competitors. When he gave himself up to our amusement, no better playfellow was to be found, and sadly did we lament the occasional interruption of our customary morning romp. He would recount fairy tales to us full of the wildest flights of fancy, sing us extraordinary rhymes, and illustrate nursery tales by means of the magic lantern, with an interest of his own in the performances so keen as to be infectious, and cause us endless amusement; and thus although, through the loneliness of our situation, we had no child companions, our lives were filled with interests.

For our parents greater facilities for society existed, especially in summer, and pleasant acquaintances dwelt within possible distance for occasional intercourse, although of neighbours there were very few. But with one such neighbour as Tennyson, social life could not be devoid of incidents of interest. Our quiet corner of the island received many visitors of note. At one time the scarlet of Garibaldi's attire would be seen disappearing amongst the trees up the drive at Farringford; whilst at another a curious throng of villagers collected to gaze at Queen Emma of the Sandwich Isles.

But the occasions of these ceremonial visits were not those on which my father sought the society of his friend. He summons him on a quiet autumn evening to view stars in particular beauty, writing:—

‘Sept. 10, 1868.

‘DEAR MR TENNYSON,—You expressed a wish to see some *double* stars. Four of the finest, the best cluster, the Dumb Bell Neb. and Jupiter are all now at their best, if the night is fine, from not later than 8.15—11 P.M., and Hercules gets low after 8.30, but wind E. is not propitious. To-night, if not to-morrow, if you will be alone, but bring only one for your own sake, to gaze quietly.—Yours very sincerely,
C. P.’

Or Mrs Tennyson invites those at Hurst Hill to join the family in the hayfield:—

‘Will your little children like to join us in the hayfield this afternoon at four o’clock? Should Mr Pritchard and yourself also feel disposed to come, we shall, of course, be very glad to see you.’

‘Professor Pritchard,’ writes Miss Weld, a niece of Lord Tennyson, ‘loved to dwell upon the many conversations on science and religion he and Tennyson had together when they were neighbours at Freshwater. He said he never should forget the deep impression made upon him when, sitting one day at Farringford with the Laureate and a scientific friend, the latter expressed his disbelief in the existence of a Supreme Being. With sudden vehemence down came Lord Tennyson’s hand upon the table, as he exclaimed with the solemn earnestness of one who knew the truth of what he was asserting, “T——, there is a GOD!”’

Walks in each other’s society were a pleasure to both. The favourite resort on these occasions was the Bacon Hill,

the highest point in the long stretch of downs which here fringe the island. A simple black wooden erection, wherein a lantern was slung, marked the spot, and proved a most effectual landmark for many miles round. Here, where the wanderings of the poet so often led him, now stands a far more imposing beacon, erected to his memory, a memento most appropriate.

Tennyson shared other traits in common with my father besides his habit of earnest thought. I allude to his love of fun, which was quite as little suspected by those who knew him slightly, as in my father's case. I had occasion once, as a child, to admit him into the garden, when about to visit my parents. Not knowing that I recognised him, he invented a lengthy and impossible name for himself, and told me to inform my mother of this gentleman's arrival. I could hear him laughing to himself as I closed the door upon him. No one was more amused than he was when a laugh was raised against him on one occasion for absence of mind. He had promised my mother the choice of two little puppies, our watch-dog having died. On the day appointed he arrived, but when he turned to show the dogs to my mother, he found no dogs were there; indeed, they had not accompanied him beyond the confines of Farringford.

Although in winter the Tennysons might be regarded as our only neighbours, summer brought many friends, old and new, to the island. Dean Bradley, Dean Hook, Dr Butler of Cambridge, Lord Hatherley, Mr James Knowles, the Pollocks, Mr Sant, the artist, and many others afforded society which was appreciated the more highly after the quiet winters. Years afterwards, Dr Butler, writing to my father, reminds him of this pleasant intercourse:—

‘Your kind words lead me to “consider the days of old and the years that are past.” They make me remember the microscope, and the *Analogy* and Herschel, and throughout the great poet was a common tie between us. He was a

great man, and I thank God that it was my privilege to know him.'

When time seemed to be rolling most quietly on, and when prospect of the possible Canonry was too indefinite to be actually anticipated, the Professorship of Astronomy in Oxford fell vacant. The news was instantly brought by a friend with the object of urging him to become a candidate for the post. My father's extreme modesty and diffidence caused him to regard such a candidature on his part as presumptuous, and he refused to listen to the suggestion. His friend, however, would not take a refusal based upon such reasons as final. He interested himself in bringing other influence to bear upon my father, the nature of which may be gathered from the following letter of Dean Hook's:—

'CHICHESTER, 26 Nov. 1869.

'MY DEAR PRITCHARD,—Heart and soul will fight for you. Why, it is the *very* place cut out for you. I entirely disagree with you that an eccles(iastical) appointment would be preferable. Any pious man with a very small headpiece will do for livings, deaneries, canonries, etc., but a man must be a man to occupy such a post as that in which I hope your friends will place you.

'It is of the greatest importance to have a religious man in a lay position. The amount of *indirect* good you may be employed in doing will probably be as important as your immediate work.

'I write at once to commit myself to you. Other friends may be in the field, but I feel so sure that no fitter man than you can be found, that I violate my rules and do *not* say,—“Wait till I see what names are in the field.”'

In another letter, dated 10th December 1869, Dean Hook, writes:—

'How clever is that first *Satire* of Horace—(it is the first

isn't it ?)—We are all of us under the notion that under a different calling we should be happier men. *I* should like to be an astronomer ! *You*, being an astronomer, think that you would like to be a pastor ! *N.B.*—Any man of piety may be a good pastor, but not one in a thousand could be a good astronomer. So thinks my Lord Chancellor [Hatherley], who turned a deaf ear to your application for a living, but will fight to the last gasp for your professorship.'

Yielding at last to such kind and encouraging counsel, my father applied for the post, and was elected, to his own surprise. But that the election was regarded by others as natural and proper, is shown by the many letters of congratulation he received from all quarters. Dean Hook, who had taken so active a part in advocating his claims, wrote on 11th February 1870:—

'MY DEAR PROFESSOR,—I congratulate Oxford, I congratulate the Church, I congratulate you on the appointment of the fittest man that England could produce to the Savilian Professorship.'

After speaking of the great interest and activity displayed by Lord Hatherley in the election, Dean Hook continues:—'I was done up, tired and frozen, when I got back to Chichester, and I had recourse to my usual remedy. I popped into bed at eight o'clock, and was just in my first sleep when there was a tap at the door—a telegram from the Professor—which gave me a good night's rest, and enabled me to rise for work at five this morning.'

And thus the quiet life at Freshwater ended. Ended with some regrets that a beautiful home, almost the work of his own hands, must be given over to others, and that the trees and shrubs he had watched from year to year would grow on under less loving eyes, but with more of anticipation and interest in the new work before him. He had learnt to

realise that a larger pulpit was about to welcome him than the narrower one from which earlier he had hoped to preach the lesson he ardently believed in, when he said :—‘ Nature and grace as I see them are not in conflict, they are in continuity.’

CHAPTER V

FIRST YEARS AT OXFORD, 1870-1881

By his Daughter, Ada Pritchard

THE Savilian Professorships of Astronomy and Geometry were founded in 1619 by Sir Henry Savile, provost of Eton, and once Greek tutor to Queen Elizabeth, who in the following year, septuagenarian as he was, delivered the first lecture in geometry himself. By this foundation his name, says Wood, will be made 'honourable not only among the learned, but the righteous for ever, even till the general conflagration shall consume all books and learning.' Professor Turner, who has made some interesting notes as to the position of astronomy at Oxford in yet earlier days, gives a list of the Savilian professors of this science from the beginning. It does not include the name of Edmund Halley, who, though a Savilian professor, was not a professor of astronomy; and the most famous, astronomically, of my father's predecessors is, no doubt, James Bradley, who was elected to the Chair in 1721. But to those who know my father's devotion to architecture, an art in the practice of which he would even maintain that his powers would have found their fullest scope, it is interesting to observe in the list of professors the name of Sir Christopher Wren.

My father's election took place early in 1870, and late in the autumn of the same year the family left the Isle of Wight. We ourselves were then too young to remember those early days at Oxford at all distinctly, but letters written in his hand,

which have been sent to me since his death, show how dominant in his mind was a characteristic sense of gratitude for the honour which had been conferred on him. 'As a security against any undue sense of elation,' he writes to his brother from Freshwater, immediately after receiving the news of his appointment, 'I resorted early to the house of God.' 'I am, indeed, full of a deep sense of humility'; and this feeling rather increased than diminished as years went on. The work was always held in honour by the worker. From letters of this date we learn also my father's high appreciation of the place in which his lot was now cast. It was late in the year when he arrived, and the beauty of Oxford, enhanced by her garment of autumn foliage, awoke in his mind an enthusiastic response; indeed, the first dim memory we have preserved of our introduction to the city was a walk he took us to see the colour of the creepers on the Founders' Tower at Magdalen College. Years afterwards, his own 'ampelopsis' on the observatory in the parks almost outrivalled that at Magdalen. In those days houses were difficult to procure, as the Oxford of 1870 had not attained the proportions it displays at the present day. North Oxford was more or less a builder's castle in the air, and within the city there was not much more accommodation than was required by those whose work was connected with the university. Life wore a more serious and thoughtful aspect before the quiet country meadows surrounding the old city were turned into long labyrinthine rows of suburban villas. The place, as my father first knew it, was nothing if not academic; but this state of things, however respectable, presented certain difficulties to the newcomer, the greater, as his occupation lay strictly within the enchanted circle. Two suitable houses only were procurable when we arrived, and of these one was to be pulled down in a year's time, while the other, demonstrably lacking in accommodation, was also confessedly badly drained. At last we decided upon No. 8 Keble Road, and while it was being

enlarged by the addition of several new rooms, took up our abode hard by in apartments in St Giles'. Keble Road, then newly built, being just beyond the college after which it was named, was conveniently close to the scene of the new professorial duties, the tiny building at the back of the Museum, then dignified by the title of the 'University Observatory.' As a matter of fact, this observatory was smaller in dimensions than either of the two which my father had built for his own private use in our garden at Freshwater. It consisted of one room, with a small dome, of which Mr Plummer,* writing to me, says :—

'When I went to Oxford in 1874, your father's ten-inch silver or glass reflector occupied and fitted that dome—fitted it to such an extent that it was almost impossible to move about.'

But more than the restricted space allotted to him, my father bewailed the want of enthusiasm for astronomical studies displayed by the younger generation of Oxford men. He himself, as far back as he could remember, had been a student of the exalted science; and the absence of even one inquiring mind on such a subject was to him almost incredible. Perhaps the thought that his election had been probably due, in some measure, to his reputation as a teacher, made it the more painful to him to experience so great a difficulty in finding anyone to teach. But, in fact, he had before him at Oxford, work which was to make him, as no tutorial successes could have done, a true successor to that 'incomparable Bradley,' of whom he had spoken so enthusiastically in his inaugural lecture on May 10th. 'He must,' said my father on that occasion, 'be a gifted, not to say an ambitious, man indeed who cannot be contented to sit in the shadow of such a memory; and he must be unworthy of his office who has not resolved to be—within the limits of his power—loyal to the example and the traditions which such a man has bequeathed to his successors.' And indeed, as it is the glory

* My father's much esteemed assistant.

of the illustrious discoverer of the aberration of light to have imparted an accuracy, previously undreamed of, into the celestial measurements of his successors, so it was certainly a task not unworthy one of them to demonstrate the possibility of applying photography to the detection of that stellar parallax which had eluded Bradley.

Letters of my father, which are almost the only record we have of these years, show plainly with what energy he set himself to instil something of his own enthusiasm into those around him. His ambition to do some work that should be worthy of Oxford grew as his delight in Oxford itself increased. On one occasion we find him writing :—

‘But it is not in these tokens of architectural genius and munificent benefactions that is to be found the true source of the fascination of the scene. The enchantment comes from the memory of famous men who, gifted with the highest and brightest types of cultivated intellect, through centuries have given life and animation to those material fabrics which so delight and instruct the eye. And then, around all this fair scene, so suggestive of mental energy and social progress, there seems to hang an atmosphere of repose and dignified prosperity. It may well remind us, in this place of ancient learning, of that spectacle of national magnificence wherewith the Athenian orator and statesman sought to allure his countrymen away from mere passive admiration and animate them in practical act, *ἔργῳ θεωμένοισι*. The perceptions must be dull, and the emotions cold, if, at the sight of all this suggestive grandeur, it be easy to repress the struggle ready to break forth into a shout of joy and thanksgiving and hope.’

In Oxford, then, my father found much to do, and did it with an energy peculiar to himself. But in the midst of his varied occupations he could always find time, as in the old Isle of Wight days, for the claims of his wife and children. I do not think that he ever went to

London without bringing a present for our mother and for each one of us. A certain sweetshop in Covent Garden knew him well. There he would spend a small fortune on the family, and a flower stall in the market was often bereft of its best contents for our mother.

In 1872 his latent (if one may so use the word) love of clerical work suggested a scheme to his mind for the long vacation months. He decided upon taking a foreign chaplaincy, that he might be enabled to carry out some favourite theories as to the right method of 'expanding the minds of his young children.' 'Geography should be impressed in a practical form,' he often said to us, and he was no less emphatic in his resolution that, besides geography, we should learn German in Germany. He always felt it a serious omission in his own education that he had never been taught German.

He had made very serious attempts to learn it during the early years at Clapham, often going abroad for the summer holidays with that intention, but we are told that he gave it up, declaring 'it was harder than Greek,' and that he never could get more than one word into his head, which was 'Schloss!' No doubt languages are harder to learn in mature life than in youth, but he might have achieved it had not his attention been distracted by other subjects. Another deficiency in his education which he lamented too late was the want of skill to play on any instrument. This being an *art*, can certainly only be acquired by early practice; but his taste and judgment in music were excellent, and in this, as in other things, nothing short of the best would content him. The music in the chapel services at Clapham was worked up to a very high pitch of excellence; and he delighted in the popular concerts at St James's Hall, where, he tells us, he used, while listening to the music with my mother, to enjoy working out mathematical problems.

This apparent incongruity seems not unknown to a modern writer, Mr Conan Doyle, who makes his detective hero, Sherlock Holmes, work out a perplexing case while listening to a performance by Sarasate.

With respect to German, he went so far as to attribute the success of two of the best known English philosophers of the day to the fact that, at a time when it was not, as now, considered essential to an Englishman's education, their knowledge of the language had brought them into touch with the greatest minds in Germany.

At Carlsbad, which he had selected as the scene of his chaplaincy, he was as supremely happy in his pastoral work as he could have hoped, the more so as he found himself surrounded by many interesting people. His sermons filled the little English church to overflowing; and after organising a choir and making the services at once hearty and responsive, he proceeded to busy himself with plans and collections for its enlargement. A motley congregation it was which assembled there in the fierce heat of those Austrian Sundays. They came, for the most part, out of pure curiosity to hear the English astronomer, persons of all nationalities and all opinions. In a letter written at that time, my father says:—

‘An abominably dishonest Jew banker said to me here, “You are an astronomer?” “Yes; at least ought to be.” “And a clergyman?” “No doubt.” “You can’t believe what you are preaching?” “Friend, you don’t believe what you are saying.” This fellow,’ proceeds the letter, ‘made a bargain with me and a great Armenian banker to sell a bit of land for the new church, and told me to go and get the money. I did so. When got and offered, the man would not sell it to me, and when referred to his repeated promise, he said, “Das was only words.”’

The new church, nevertheless, was built. It was said of my father that he was never happy unless he had some build-

ing scheme on hand (here his architect predilection was practically evinced), but the completion of this particular scheme did not leave him long unoccupied. He returned to England to set about the erection of the new University Observatory, a building which has since been described as 'the enduring memorial of the spirit in which Professor Pritchard interpreted the duties of his office.' Its story is authentically told further on in this volume by Professor Turner: ours is only the memory of childhood. But it serves to recall very clearly the energy with which my father threw himself into the work.

After quitting Carlsbad he left us all in Germany, still little students of the language he expected us eventually to master.

We were in a hotel at Wiesbaden, with our mother, a governess and a nurse throughout that winter, father coming and going at each month end. He thought little or nothing of the journey, and each day, as was his custom when separated from her, he would write long, detailed, characteristic letters to our mother. These letters were full of the progress of the observatory, so bound up were his thoughts with the beloved building which it was his pride to be raising 'in this queer place, full of greatness and narrowness both at their maximum,' as he wrote to her once, 'where I have asked for nothing not granted.' And he asked, it may be added, for a great deal.

It is in accordance with my father's entire simplicity and modesty that evidently none of his letters were intended to be quoted or even kept. They were, indeed, for the most part, penned on odd sheets of paper, generally the ordinary MS. paper he used for writing his lectures. Always written on the spur of the moment, they were all the natural outcome of a mind entirely free from self-consciousness.

The handwriting of these quaint, original notes was, for its beauty, a never-failing source of admiration to his corre-

pondents : strong, characteristic, legible to the last—a handwriting which had its own little band of imitators. All persons who worked with him or under him would assimilate their style of writing more or less to my father's. He tried to instil into his family an ambition to write well ; urging us all to sign our names 'not conceitedly, but as if you were proud of them.' Once a niece sent him a copybook of the new-fashioned, upright mode of teaching handwriting. He immediately wrote back, 'I am a convert,' and covered sheet after sheet with absurd imitations of the new style. He often illustrated his sentences with grotesque pen-and-ink drawings. If anything in public affairs had excited his feelings of disapprobation, a gallows with the political offender hanging therefrom was not unfrequent among these decorations. Otherwise, I do not think he took any strong interest in politics, thereby avoiding the rock on which his father's fortunes in Shrewsbury had been wrecked. Perhaps some tradition of that catastrophe had made an early impression on his mind, and helped to inspire the strong aversion he always expressed to anything like *party* spirit.

Life in Oxford is a busy enough one during Term time to a professor who works up to his academical requirements ; and my father, by all accounts, did not confine his work to the actual sphere prescribed to him by the university canon. Besides the observatory work proper, all that could be done to interest his fellow-citizens in his own particular science he certainly tried to do. He would show the stars himself, and spare no trouble to explain away any difficulties which were present to people's minds. How many times he would go over to the observatory after dinner, late in the evening, for this purpose, cannot be numbered. There was a private door to the Parks near our house, and through this he and his man Mullis, lantern in hand, would go, at the request of anyone who wished to see the moon through the big telescope in the De la Rue dome. It is certain that people thus coming and

going occupied no inconsiderable share of the precious hours of each day ; but he gave his time willingly, ungrudgingly 'to the inquiring mind' which concerned itself either with science or religion. He often presided at the meetings of the Oxford Bible Society and the Christian Evidence Society, sparing no pains with his addresses on such occasions. On this subject Canon Liddon writes, in 1877 :—

'I am very glad indeed that you are at liberty to give the address suggested by the Christian Evidence Society, Whether any of my colleagues have been applied to by the society, I do not know ; but certainly, as far as I am concerned, I rejoice to think that you are in my place. Physical science has great advantages over divinity on an occasion of this kind ; its witness is certain to be more accurate, and be generally believed to be more disinterested than that of a Professor of Theology. . . . I had some hesitation as to handling such a subject in a popular way in a place like Oxford, which your knowledge of the state of minds in this place would suggest to yourself. But probably this is not the best way of looking at the matter. Indeed, whenever you are so good as to call, I should think it a great honour to have a talk with you over these things.'

I remember long after this my father saying to some friends who were calling :—'A celebrated scientist, who is now dead, said to me on my appointment to the Savilian Professorship,—“Do not mix up theology and astronomy at Oxford. Times have changed ; they like these matters kept distinct. You are there as a Professor of Science, and not as a Theologian ;” and yet,' added my father, 'I have never attempted to separate the two.'

Looking back now on a life so varied, so many-sided, it is hard for us to transfer any just impression of it to others through the medium of pen and ink. Passing, as he did, in a single day through a hundred shifting moods,

he was by nature ever ready to sympathise with his surrounding friends, to weep with those that wept, and laugh with those who laughed. And how he could laugh!

It needed but the shortest of acquaintance with my father to discover his sense of humour, love of fun—a quality, indeed, which was apt to manifest itself somewhat unexpectedly, alike in his conversation and letters. His horror of any suspicion of posing for effect had something to do with this habit. He often threw off the effect of an emphatic and pathetic sentence by quoting the speech of an old Shropshire market woman which had seized on his early childish fancy, “‘Ah, well, you see, things bees as they am,’ or, as Bishop Butler in his *Analogy* puts it less elegantly, ‘Meanwhile, things are, what they are.’” He was very fond of quoting this speech, though its theory of non-resistance was not perhaps much in keeping with his own more vigorous philosophy.

When, after a year's absence abroad, we returned to him at Oxford, we found his interest in the progress of the new observatory at its height. But in his rare holiday hours he would delight to wander about the beautiful home of his adoption, and point out to his family what struck him most. And so many new thoughts and fancies did strike him, that a walk or drive with father was always more or less of a revelation to those who were his companions. Nothing was lost on a mind attuned like his, to love Nature in her every phase and mood, and as we listened we used to catch something of the enthusiasm of the speaker ourselves. For not only had he the gift of a deep sensibility to the beauties of Nature, but the rarer gift of expressing it in a manner both unique and impressive. He early taught us to study Nature, to love and admire her. He was our instructor in botany, and our half-holidays were devoted to searching for specimens out in the meadows and ditches beyond the river at the end of the parks. We

thought a great deal about the loss of those half-holidays. I don't think we half appreciated what was bestowed upon us by the father who so indefatigably worked to enlighten our lesser minds.

He would say to us that it was our duty to appreciate the beautiful—a duty, as he would lament, too often neglected. Many there are who still remember how, by day and by night, he would exclaim in his home on the hill at Freshwater, 'How beautiful, how beautiful, *and* how beautiful'; and to us he would say it long afterwards when, in his old age, seated in the Oxford garden, with his eyes facing his flowers and the city spires, behind him the observatory. and above him the firmament and the stars, 'How beautiful, how beautiful, and all are of GOD and point to GOD.' Indeed, his passionate delight in the beauties of Nature was ever present in his speech, and found expression in his letters. After a visit to the New Forest, he writes to Dr Perowne (then Dean of Peterborough):—

'Till you have seen *that*, when the trees put on their new clothes, with the birds, you have seen nothing of woodland scenery. It is the glory of GOD selected and appointed. We saw a mile of conifers, thirty years old. It was like the Nebula of Orion or the Alps seen for the first time. *Les Alpes, les Alpes!* Ah, it is a beautiful world, and He who fashioned it is good; yes, good to all His children. *Sua si bona norint.* Glory from the little chionodoxa or the daffodils, up to the cedars of Lebanon.'

The allusion to 'the birds' in this letter reminds us that we cannot pass over without mention his great love of them. One of his greatest pleasures was the possession of the large aviary which he added to the observatory. It was full of singing birds, and to their music he worked, as he did (mentally) to that in St James's Hall. Ruskin, who had also a great love of birds, used to go over to see them, and in this way he and my father often met.

Then in the same letter he goes on to speak with enthusiastic admiration of his own garden, where he had his tulips, 500 or so (early and Gesneriana), daffodils a thousand, and where wall-flowers, yellow alyssum, white and yellow candytufts and tulips were 'all aglow like the meteorites without collision.'

It was during the first ten years of life in his adopted University, and when he really wanted rest and quiet, that he settled upon a small cottage in the Malvern Hills to which he could repair and 'think.' The garden of the cottage ran up the mountain side, and his study, built on by himself, commanded a view of the plain stretching away in front to a far distant horizon. Here, nominally resting, he, in fact, worked hard. He wrote a number of sermons, afterwards preached in Westminster Abbey, Salisbury, Hereford and Worcester Cathedrals, and in the Abbey Church at Great Malvern. Here it was, too, that he prepared his lectures on his much-studied Butler's *Analogy*.

'Good, kind Mr Ffoulkes,' he proudly wrote, 'has given me now *carte blanche* for four sermons or lectures on Butler's *Analogy*, to be delivered in the University Church at Oxford. Somehow, this has been one of the desires of my later life.'

Here also he gave his children lessons in Greek and algebra and botany. In after years he often talked of the happiness the quiet life at Malvern had brought him. When the lease of the cottage was up we spent most of the Oxford vacations abroad. He had himself a large acquaintance with the Continent, which he much wished his wife and family to share with him. And what we saw on these tours has ever remained indelibly impressed upon our minds, so much interest did he manage to infuse into the scenes and places we passed through.

It always seemed to us, his children, that he had an extraordinary knack of giving broad general facts in a

specially interesting manner; to a child's mind he paid the invaluable compliment of crediting it with an intelligence equal to his own. In 1878 he took abroad with him his son, Eric who thus describes the wonderful month he had alone with his father:—

‘A FEW REMINISCENCES OF A JOURNEY TO CENTRAL FRANCE WITH MY FATHER (1878).’

By Eric Pritchard

‘In 1878 my father made up his mind to visit for the second time the volcanic districts of Central France.

‘Once before, I believe in the year 1859, he had made this expedition, and partly as the result of a conversation with Sir Joseph Prestwich, then Professor of Geology at Oxford, partly as the result of a re-perusal of Scrope's *Extinct Volcanoes of Central France*, he determined to refresh his memory by a second inspection of this interesting locality. It was a principle he always acted upon himself, and never failed to impress upon others, that to remember a thing you must see it; in fact, one of his favourite quotations was Horace's enunciation of this principle.

‘Although only twelve years of age at the time, I can well remember my father explaining what a magnificent object lesson it would be for me to accompany him on this journey:—“Travel,” he used to say with Bacon “in the younger sort is a part of education.” Indeed, the entire neglect of my education in some other branches during this period of my life inclines me to think that he looked on it as the chief part.

‘It was indeed a proud moment of my existence when it was finally arranged that I was to be my father's companion. Never shall I forget the preparations that were made for this journey. As an old traveller he had very decided ideas as to how such an expedition was to be

conducted: no detail was to be left to the occasion, all was to be thought out and arranged beforehand, written in black and white. As I write now I have before me on the flyleaf of Scrope's *Geology* a full itinerary of our expedition from start to finish, from the train by which we were to leave the Oxford station until our return to the same about six weeks afterwards. As an instance of the minuteness and accuracy with which such itineraries were arranged, my sister reminds me of an entry which he once made for her benefit, before starting on a journey to Switzerland. It was to the following effect:—"Half-an-hour at 'the Devil's Bridge for Rosie and Ada to sketch."

'My father had a theory of disposing of his travelling impedimenta in such a way that everything was packed in a multitude of small bags and parcels, to the exclusion of larger and more convenient receptacles. "We must not take anything we cannot carry in our hands," was the regular formula on such occasions; and as I was quite a small boy at the time, and the weight which I could carry proportionate, our baggage finally resolved itself into about twelve separate packages. These small parcels were my bugbear during the journey. I could not carry more than three or four at a time, and this necessitated repeated journeys to and fro between carriage and carriage, or between waiting-room and train. I was in constant fear of being separated from my father by the train moving out of the station and carrying him with it whilst I was returning to the central dépôt for a further load. My father never carried anything himself except his umbrella and his small handbag, the latter containing our tickets and money, which "must have," he said, "his undivided attention." The fact was, he was just then beginning to feel a diminution in strength and activity, owing to increasing age and corpulency, and he was very reluctant to own to it!

'He once wrote:—"I have a great love and admiration

for youth. I do not love old age, and I don't want to grow old a day before I must." He further insisted on taking with us two or three spare canvas bags. He made rather a mystery about their subsequent employment, but persisted that we should find them useful. Later on I discovered their use, when they came home full of minerals, lava, volcanic cinders, fossil remains, and other lithoidal mementos of our journey. This collection proved a considerable stumbling-block to the Custom House Officers, and in spite of our protestations the contents of our sacks were shot out on to the floor and submitted to the rude gaze of the officials and our fellow-passengers. They have since been presented to the Oxford Museum.

'My father made me a present of a small diary, and insisted on my taking full notes of what I saw; and though I have long since lost what would now be a useful record of our doings, it is doubtless owing to the fact that I did keep such a memorandum that I can still recollect much of what took place so long ago.

'On our way to Marseilles we made but one break in the journey, and that was at Paris, where we stayed the first night and following day. My father, who had not visited France since the days of the Commune, was much interested in the changes which had taken place since his last visit. He frequently stopped at the corners of the streets and pointed out to me how easy it would now be to put down a riot by placing artillery in the centre of the squares, and thus commanding miles of street in all directions. During the day he took me to see Notre Dame, then decked in deep mourning for the death of Pope Pius the Ninth. The entire Cathedral was draped with black cloth hangings from the ceiling to the floor, constituting as dismal a picture as it is possible to imagine. It was highly characteristic of my dear old father that he should improve the occasion by making me calculate how many

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yards of cloth were hanging on the walls, and at a rough estimate how much it would cost the ecclesiastical authorities.

'He was exceedingly fond of chaffing any of his fellow-tourists, and I can remember on this occasion he acted as a sort of self-constituted guide to a small party who were making the tour of the cathedral. I don't know what nonsense he did not tell them, but I believe they implicitly accepted all his statements. On one of these occasions, when he was chatting to a large tourist detachment, somebody asked him if he were one of Mr Cook's party. "No," he replied, "I am Gaze."

'At Marseilles, where we stayed a couple of days, I was encouraged to pick up a few colloquial expressions, and was allowed to buy whatever I could ask for myself. In this way I soon knew how to become an extensive purchaser of oranges, fresh dates, French pastry and creams. I can vividly recall my poor old father sitting in a chair in a tempting *pâtisserie* shop, talking to the shop girl, and making jokes about me as I tried to eat gracefully a marvellous cream tart, the contents of which escaped on all sides at every mouthful.

'From Marseilles we travelled to Hyères, and took up our quarters at a most delightful hotel, by name "Hôtel des Isles d'Or." According to the tariff in our guide-book, my father had discovered that we could obtain board and lodging at 7 fcs. 50. The proprietor, I remember, made a great demur at thus taking us in at the minimum rate, but my father, by threatening him with "exposure in the English *Times*," obtained his point, and secured rooms on the top floor. Although it was a great exertion to him to clamber up so many stairs, he submitted to the discomfort rather than "be done," as he put it.

'Although seventy years of age, and very stout, my father was still exceedingly active, and every day he took me for a long walk in the country. A keen botanist, he

took great interest in the almost tropical vegetation of the surrounding neighbourhood. He wrote on his return home : —“I now have some idea of the East, for I have seen a palm tree growing out of doors.” He liked nothing better than to wander through the market gardens and inspect the early vegetables for the Paris and London market.

‘He liked me to be able to put my hand to anything, and it was always a joke against him that on one occasion he made arrangements with our family baker at Oxford to teach me how to make flaky pastry and three-cornered puffs ; I don’t know whether anybody else appreciated the results, but he himself declared them to be excellent. He often used to say that when he was a boy the household word was “Education, education” ; he certainly never forgot the lesson he then learnt, for my education, up to the time I went to school, was, I should say, the most heterogeneous that ever boy received.

‘From Hyères we made a few excursions down to the sea, which was only a few miles off. A considerable industry was carried on along the shore in the removal of sea-weed for manure, and for the subsequent preparation of bromine and iodine. My father explained to me the process, and described to me the uses and chemistry of these two elements. He had a remarkable facility for putting even dry matters in an interesting form, and what he told me then made a far more permanent mental impression than what I heard subsequently at lectures. We also saw the preparation of crude salt, which was effected by the evaporation of salt water in large tanks placed a small distance above high water mark.

‘One of our walks led us to the church of Notre Dame, situated in a most picturesque spot on the top of a neighbouring hill. On our way thither, we came in contact with a pilgrim procession, which was slowly wending its way in the same direction. For some reason or

other, I wanted to get to the other side of the road, and in so doing, I had to pass through the ranks of the procession. I made a dash through the first appearance of a gap; a stout peasant, however, barred the way, and a volley of abuse was hurled at my head for a sacrilegious infidel. My father was very angry with me, and told me that I ought to have known better, and that these fervent catholics were very touchy at any disrespect for their superstitions or observances.

‘Before reaching the Auvergne district, my father had arranged to visit Toulon, Nîmes and Arles, all places of interest; and at the former he made me arrange with a boatman for a sail in the wonderful harbour, and at the two latter towns he showed me the old Roman remains. At Arles we spent a long time wandering about the amphitheatre. For many years the huge building, with a diameter of nearly 500 feet, was filled up with a dense mass of miserable hovels, which afforded shelter to some 2000 of the poorer inhabitants; more recently this rookery has been cleared away, and the amphitheatre remains much as it was in the time of the Romans. It now affords shelter to innumerable lizards, which we found sunning themselves on the stone and marble slabs. The outer masonry is in a wonderful condition of preservation, and remains almost as complete as the Coliseum at Rome. Near Arles there is a curious plain covered entirely with large boulder stones; it has a mythological interest as the battle-field of the combat between Hercules and the Ligurians. My father was very anxious to show this to me. He showed me a passage in our guide-book which described the battle, telling how Hercules ran short of arrows and would have lost the day had not Jupiter intervened and afforded him a heaven-sent reserve of stones. These he hurled at his enemies, and hence his victory and the stony plain. He added that, as a matter

of fact, the true explanation was that this was one of the original beds of the River Rhone.

'The town of Clermont is surrounded by mountains, forming a series of volcanic chains, the highest apices of which occasionally rise to a considerable height. The Puy de Dome is the highest of them, being nearly 5000 feet above sea level. At the top of this latter mountain there is a small meteorological station in telegraphic communication with Paris. Towards this so-called observatory my father used to cast longing eyes, and bitterly complained that he was not so active as he had been. He told me that it was on this mountain that Pascal made his original determination of the weight of the atmosphere, and I suppose it was this fact that made him insist on my taking a few practical lessons in the use of the aneroid, and measuring the height of the different mountains we ascended. I believe it was the Puy de Pariou, a mountain of less ambitious height, that he made an attempt to climb. We took a carriage, drove as far as the road would allow, and then secured the services of a guide. I remember his chaffing the good-natured mountaineer, and telling him that he also was of his fraternity and a guide of Mont Blanc, a statement which must have been received with doubt, when after about half-an-hour's climb he refused to go any further, and left me to complete the ascent by myself. As we neared the top of the volcanic crater, my excitement became most intense, for I had only vague ideas of what I was going to see. I thought, however, that there was some element of danger connected with it. I expected to find at the top the orifice of a bottomless pit, and I had visions of having to lie on my stomach and carefully peer over the edge into the darkness below. My astonishment was, however, great to find merely a bowl-shaped hollow, like an enormous pudding-basin, the steep sides of which were thrown into

regular ridges, covered with grass and a few low bushes, and right down at the bottom some half-dozen sheep quietly grazing.

‘I had been told to descend into the crater as far as I could, and measure, with my aneroid, the depth of the depression. According to my calculation I had descended about 300 feet. As I stood at the bottom the sensation was peculiar; the air was motionless and warm, not a sound to be heard, and nothing to be seen except grass and blue sky and the grazing sheep. I felt so lost in the solitude that I was quite relieved when I clambered up again and joined the guide, who had wisely waited at the top. I certainly was much disappointed at not being able to find a hole at the bottom, if only to indicate whence the fire, smoke and lava had originally issued. Grass and sheep were not what I had expected to find in the interior of even an extinct volcano.

‘On joining my father at his halting-place, I found that he had been spending his time in tracing out with his eye the course which the lava streams from the various volcanos had originally taken. That from the mountain on which we stood could be easily recognised as a distinct and isolated ridge elevated slightly above the level of the surrounding ground, and presenting a distinctive and rugged surface.

‘On our way down to our conveyance he produced one of his empty canvas bags and began to select various specimens of lava, cinders, pumice, etc. Two particularly interesting specimens, by a curious coincidence, we found side by side; one of them, for which we had been hunting for some time, was what my father called a galvanic bomb. It was a doubly conical-shaped mass of lava. The other specimen which we found lying alongside was a piece of iron which had splintered off an altogether different kind of bomb, namely, a modern shell which the artillery, in their practice, had thrown on to the mountain side. My father was as pleased as a child with this discovery, and both specimens were subsequently

preserved side by side in his cabinet and shown to all comers.

‘Of Le Puy, our next halting-place, I have very distinct recollections. In the centre of the town stands a lofty and imposing rock, keeping watch over it like a solitary sentinel, and it was explained to me how this extraordinary mass came to be situated in the midst of what is otherwise a considerable plain. On the summit of the rock is a huge metal statue of the Virgin, hollow within, like the Trojan horse, and containing an iron staircase by which one can mount into the head. It is made with the cannon taken from Sebastopol—about 212 pieces. My father insisted on climbing to the top of this structure, and from the occasional chinks in the iron he prospected the neighbouring country.

‘We made numberless excursions into the neighbourhood, and in a few days completed our sojourn in Auvergne, returning to England by Lyons and Paris.’

This picture of our father, as he appeared on his travels, may here be supplemented by the following quaint letter from himself, showing that advancing years robbed him neither of his power of enjoyment nor of his pleasure in arranging for the enjoyment of others:—

‘CHAUDE FONTAINE,

‘*June 21st* (I think), 1881.

‘Anyhow, *Tuesday*, 4.30 P.M.

‘MY DEAR WIFE,—Having nothing better to do, I took a return ticket here—a place I have long wished to see. It is more lovely than ever I expected, in a valley basin surrounded by wooded hills. From fir woods at the top, where I have been, is a grand amphitheatre view. You must come and spend a long day, and you will be delighted. Woods, water, hills. Behind me, about ten yards, are sixty-five people at a marriage feast. I saw the whole party disem-

bark from about twenty carriages. There they go! Not a beauty among them! but such tons of bouquets. Some well-to-do people from Liège.

‘You might have sent me a post-card daily. Nothing for me at the post to-day at 11.30. Please do write someone, if not too late.

‘Bring everything you want to make you comfortable. (Studs for me, Mullis will get them.) You may bring my favourite kettle—it will be useful.

‘I will try to meet you at Antwerp. If I don’t, you must appeal to the steward to help you. On the quay close by are cabs. The real fare is one franc, but you may be asked five, or even six! Demand quietly the tariff. There is a new station half-a-mile from the quay. Your train leaves at a quarter-past one, mind that, else you will have to wait at Malines if you go off earlier; you can go and see the pictures and the cathedral again. But should you arrive in time for the nine o’clock train (and you may) then get off by that. But I expect to be there. If I miss you by chance at Spa, then Hôtel Britannique. To-morrow, Wednesday, I send to General Steam Navigation to have on board the steamer return tickets for all of you.

‘Ask Mullis to get Mr Plummer to send me a report of the Obs. by you. Mullis is to devote himself to you all Thursday and Friday, mind that.

‘I hope I have given you all directions. I have said all, but I do so wish someone had written me, even a penny post-card daily. Love to all.—Your affectionate husband,

‘C. P.’

CHAPTER VI

LIFE AT OXFORD, 1882-1886

By his Daughter, Ada Pritchard

IN the year 1879 the Radcliffe Observatory was placed under my father's control during the interregnum caused by the death of its director, his friend, Mr Main. It was a pleasure to him to find time for the working of two observatories at once, and he went so far as to express the sentiment that 'we are never so happy as when we have a little too much to do, and do it.'

I have many letters about this, but the following to Dr Acland seems best worth quoting :—

‘UNIV. OBSERVATORY,

‘*June 10th, 1878.*

‘MY DEAR DR ACLAND,—I well know the lively interest which you take in all that appertains to Oxford, and not the least to the astronomical branches of it.

‘I have now been for a few weeks in temporary charge of the Radcliffe Observatory. It is a very noble establishment, and contains the elements of an institution which I am convinced might, without great difficulty, be one of the very first in Europe. There are, however, details and arrangements within it which I feel convinced are not fully within the cognisance of the trustees, but which seem to me to require their consideration, and this, I think,

can only be given effectually before a successor to Mr Main is appointed.'

In this spirit (of delight in 'too much work') he gave his aid to a project for the establishment of a series of 'City Lectures' in 1880, himself lecturing in the Town Hall on 'The Life and Discoveries of Sir William Herschel,' perhaps in the hope of arousing in the town that interest which he had found wanting in the University. 'The man himself, William Herschel,' he said, 'was a romance, and a very noble one, and so are his wonderful discoveries. But I must guard myself against misleading you into the thought that astronomy, in its other branches, is a romance or merely an intellectual treat, to be enjoyed or avoided as the taste suggests. Let me remind you that men have mouths as well as minds, and that it is owing to astronomy that the produce of the East and West is brought to our markets; by the aid of astronomy that the Atlantic cables are laid and can be found again at the very spot where they need repair. By astronomy we maintain our intercourse with our countrymen throughout our empire, on which the sun never sets.' It was not in Oxford alone that he was ready to help in any public spirited scheme; and, two years later, a more formidable task was undertaken, when, in 1882, the Rector of St Edmund's, at Northampton, in conjunction with several other clergymen, wrote and asked my father to address an assembly of Mr Bradlaugh's adherents on certain difficulties which, it was alleged, stood in the way of their acceptance of Christianity. 'The project seemed at first to be beset with perils, and to offer but little prospect of eventual good,' he remarks, but finally, despite some misgiving as to his self-ascribed lack of 'readiness,' he agreed to do as he was asked in this matter.

His sceptical opponents he thought 'little enough versed in the real drift and strength of their own assumed

opinions. They followed, as it seems to me, the dicta of the more vivacious leaders whom they have selected, whether from conviction or from fashion, and have personally but little worked out the causes or the consequences of their own objections.'

After the address a discussion was invited, and, in my father's words :—

'There rose up, amidst considerable applause, a gentleman, who seemed to be a corypheus among them. He said that one result of his own studies had been the conviction that the form of religion in any place very much depended on its latitude and its longitude, and he therefore wished to ask the learned lecturer whether in any place it might be lawful to worship a crocodile. He sat down amidst applause even greater than that which occurred when he rose to put this presumed annihilating question. I remarked that I so far agreed with my ingenious friend that it did seem a fact that locality and surrounding circumstances modify the purely external forms of religion, and that if my friend lived in a country abounding with crocodiles, and if nothing within his own mind and spirit, and if nothing external to them, suggested a different form of worship, then he had better worship a crocodile than nothing at all ; but inasmuch as my friend lived in the beautiful town of Northampton, where I had failed to find either zoological gardens or an aquarium, if he in Northampton elected to worship a crocodile in lieu of any other object of worship at all, then the responsibility rested with himself.'

No doubt my father's prolonged enjoyment of work depended largely on his power of enjoying leisure to an equal degree. His holiday spirits at this time were still exuberant, overmastering, infectious ; and those were red-letter days to us when he would go with our mother and ourselves up the river, or away for the day on some longer excursion,

leaving his books with their grim array of figures behind.

To understand father in his 'computing' room was not by any means to understand him on a holiday, unless you had previously grasped the fact that whatsoever he did, he did with his whole heart and soul. He had a happy knack of throwing off his work, and this it was that I think kept him so young, for, up to the last, he was positively youthful in his power of appreciation and enjoyment. He often said of himself that he had been the most 'juvenile' guest at a dinner party, and Mr James Knowles, revisiting him in these Oxford days, writes of him that he was 'always the same man, or rather almost boy, in his enthusiasm and curiosity and courage.'

A striking proof of these qualities was now to be given. In the course of the preparations for the great work on the comparative brightness of the stars to which the resources of the Oxford Observatory were being applied, it had occurred to him that the question of atmospheric absorption might be profitably studied by comparing results obtained in the Thames Valley with others obtained in the 'proverbially transparent atmosphere' of Egypt. To Egypt, therefore, at the beginning of 1883, he betook himself, with my mother as his companion. Mr Jenkins, his second assistant at the observatory, went too, and the big telescope accompanied them—at least, it looked very big when it was packed. A letter direct from Lord Granville protected this unusual piece of luggage against any undue custom-house interference.

Before they started on their journey, father, with his customary insistence on such matters, said to us, 'You must write every day. I have left a memorandum of where we shall be on such and such a day, and we shall expect to hear daily. In the same way a report will be forwarded from the observatory.'

At Alexandria, the Khedive's barge was despatched to convoy 'L'Astronome,' who installed himself with my mother at Shepherd's Hotel.

'My own first view of the Pyramids,' he writes later, 'was from the top of a roof over the side of my telescope, the oldest and the grandest specimens of the art of to-day.'

'The day after we arrived,' he wrote home, 'your mamma and I and Mr Jenkins, and a nephew of Mahomed Pasha Fallaki, started to arrange for Mr Jenkins to go and live at Abasseyah. The observatory, as you know, has been placed at my disposal. The building is terraced, and has as lofty a tower as the Radcliffe. The instruments are small, but adequate for moderate purposes; a small elaborate T. C., 2 inches in aperture, and 12-15 inches about, and a small Theodolite. Mr Jenkins has Arab servants who can't speak a word of English, but signs do the work of language. We chose a capital room with sofas all round it; and after enjoying the prospect we left, regretting, too, that we were not going to live there ourselves in the sun and the solitude.'

Mr Jenkins relates a rather curious incident in connection with his sojourn at this place. Feeling, when the sun was gone, the solitude extolled by my father somewhat oppressive, he remembered with pleasure that a box of stores had been despatched to him by my parents from Cairo, containing all creature comforts calculated to sustain a living Englishman left without company in the land of the dead. Turning, therefore, to a large box at his side, he applied himself to the task of tearing out nails and forcing up the lid with a zeal sincerely regretted when it became evident that his labour was mis-directed, and that by way of enlivening his solitude, he was interrupting the repose of a mummy!

My father's letters from Cairo were filled in turn with bright thought, deep reflection, humour and pathos. Every day, according to his wont, he wrote to us at some length,

keeping us in close touch with his surroundings. He entered into the social life with a curious new zest, which our mother declared was quite unlike anything she had seen in him before. Cairo was described then as being at the zenith of its social brilliancy, and Shepherd's Hotel was filled to overflowing with interesting people.

'Under the verandah we all meet,' they wrote home, 'a motley crew—the Duke of Sutherland, Lord Napier of Magdala, Sir Evelyn Wood, Sir Archibald Alison, Sir Charles Wilson, the Brasseys and ourselves. It is very entertaining here, inside; and outside, the bright panorama, passing constantly before our eyes, under the vivid blue sky, is hardly less remarkable.'

Conversations with many of these people intersperse the letters. 'They are all so cordial in their welcome to the wandering astronomer,' we hear, 'and most kind.' Into the political problems presented by Egypt at that time father threw himself enthusiastically.

'Our Government,' ran another letter, 'has given Sir Evelyn Wood *carte blanche* to choose his own officers for the re-formation of an Egyptian army. He has chosen men of prudent enthusiasm for right, and these men (one of whom, Col. Duncan,* I know) tell me much about the affair. They are trying to raise the character of the Fellaheen conscript soldiers by treating them with justice and truth for the first time in Egyptian (the world's) history; then, in due time, letting them go home to their villages and tell their brethren what things they have seen and heard, how their pay is good, and regularly given, to their utter astonishment, which they do not fail to express: then they are not allowed to be beaten by their officers, † indeed,

* Late M.P. for Finsbury.

† Curiously enough, Lord Salisbury, speaking on this subject (May 1896), corroborates the anticipatory remarks made by my father thirteen years previously. "There were persons who told us, relying on experience—I may say the

their officers have been arrested already for striking them. . . . They always prefer English officers over them. Our general is bent on raising the character, if possible. His mind is set upon it; I heard much concerning this vital question at the Commander-in-Chief's dinner the other night.'

Another letter of a more personal nature, dated 6th February 1883, runs thus:—

'I had accepted the offer to go with a young artilleryman to the Mocattam Hills, to the place where Newton* and Company, in 1874, observed the transit of Venus. This is the highest ground of Cairo proper, close to the grandest Mosque of Mehemet, and all Cairo and the Nile lies before you. . . . We got out of our carriage, and, like mad people, commenced our ascent by zig-zag winding roads, amidst sand, rocks and quarries; no real road it was. After three miles I gave in. I lay down, tired out, with a bit of rock for my pillow, sun 140°, on my back. I had no umbrella, no "nothing," and we had madly gone on a journey no sane people attempt save on donkeys. Still, there was a delicious breeze, as there almost always is here, and I resuscitated in half-an-hour. The view is an amphitheatre, complete. All Cairo, as I said, at your feet, the Nile, Egypt; a view unique in the world. . . . By dint of perseverance we got down to the carriage, drove to the artillery mess, had lunch, and got home.'

After this came the voyage up the Nile to Karnak and Thebes:—

'We have the chief cabin, and we expect great things,' irrelevant experience of twelve years ago—that we should find that the Egyptians will never fight, and that our expedition, if it is to be carried out, must be carried out by English troops. I do not attempt to forecast the future of the campaign; but I am justified in saying that the calumny that the Egyptian troops will not fight has been satisfactorily disposed off (cheers). They have fought as gallantly as any other troops could fight, and it is no wonder that they should have fought well."

* An Oxford pupil of my father's.

my father writes. 'You have seen *nothing* till you have seen Thebes, Lord Dufferin told me at dinner the other night.'

From their floating home vivid word-pictures describing the realisation of their expectations were sent home to the family at Oxford, and, added to the word-pictures, many an illustration, too, from mother's brush. 'I cannot imagine a greater treat than floating up this marvellous river in good company as your mamma and I are doing. It is a glorious day, but all days are glorious here. I hope to show some friends of ours on board the moon and some double stars through my small telescope. Jupiter and Saturn are here too high in altitude, they would be inconvenient to see. The Pole star is lowered greatly, and many stars set which do not in England. It is in fact a little puzzle at first to recognise one's old familiar sky. Your mother has drawn you a little sketch of the Southern Cross as she saw it early one morning from the windows of our Dahabiyeh cabin.'

We hear of many adventurous donkey rides across the plain to outlying villages. My father in one letter describing himself as 'winner of the Derby,' and as 'cantering' back to the shores of the Nile where the vessel lay moored. That day he had made a ride of three hours, a feat which, to appreciate fully, one must consider the rider's heavy weight and 'seventy-four summers,' as he put it, for his seventy-fifth birthday was celebrated at a State dinner party given by Lord Dufferin at the end of that same month.

But all through these letters, which came daily without fail to us, there is shown a constant and touching remembrance of the children at home.

'Of course our thoughts recur daily to you all at Oxford. We are still sailing away from you, already 2,000 miles off, and still on and on. I believe I am here within the field

of my duty, else I should not be so blithe as I am. GOD bless you all.'

The sight of the Karnak ruins made a deep impression on his mind, and from Athens, which he visited on his way home, he wrote to his son Eric:—

'I preached a sermon at Cairo, just before I left, on the nature of Egypt and its present state, and asked wherein *we* are better than No-Ammon (Thebes). I took great pains, and my mind was full. Lord Napier heard it, and was so struck that he asked to be introduced, and gave us such an instructive talk; his estimate of things agreed with my previous one. Before we left, he gave us a letter to a lady here, Miss Jule, a most cultivated woman. He told her how he had been struck—a rare thing, said she to me, for dear Lord Napier to be struck in that way by anything. So I am rewarded and encouraged. Now,' he adds, 'do *you* do your best always, we don't know what may come of it . . . The work of my youth is paying me now by exquisite enjoyment and comprehension of what I see. You in your school-days have great possibilities.'

Elsewhere he tells, with some regretful comment, a story of this journey, which shows that his eloquence was not invariably successful:—

'We were anchored on Sunday morning off Karnak and the ancient Thebes on the banks of the Nile. Morning service was celebrated on the deck of the steamer. We formed a heterogeneous assemblage in respect of religious denominations. The Church of England and of Rome were represented, and two Presbyterian and Nonconformist ministers on board. Still, the wonderful quietude around us and the superb sky above us soon reduced our spirits into harmony, and it was agreed that I should read the Litany in the Prayer Book, while the earnest Scotch Presbyterian minister should preach the sermon. It was an occasion unforgettable by us all—magic in its circumstances and sur-

roundings. The Christian hymn must have been echoed along the walls and the columns of ancient Thebes back to the hills beyond.

‘During the service we had been watched, I saw, by the Mahomedan dragoman on board; he was a man full of intelligence, and had greatly contributed to the enjoyment and information of all on board.

‘The service concluded, I cautiously commenced, or rather attempted, a conversation with him, directed more or less to what he had seen and heard. The eyes of the man indicated emotion within him; suddenly he drew himself up, and he said, “Sir, I am a Mahomedan; not as good a Mahomedan as I ought to be, but I hope to grow better. I am a Mahomedan; you Christians worship three Gods, Mahomedans worship one,” and there ended our brief conference, within sight of the ruins of Karnak. It was useless, I felt, to continue the conversation; nothing that I could say would have convinced him that he had mistaken the Athanasian creed.’

Much as my father enjoyed Egypt, his visit to Greece seem to have delighted him even more. Of Athens he says:—

‘We both agree that what we saw to-day of the Acropolis is by far the most glorious and exciting sight we have seen. Even in point of beauty alone, the sea, islands, mountains, colouring, foreground, background, are altogether overwhelming. Whilst Karnak holds its own for sublimity and majesty, here is the intellectuality of perfect beauty. The whole Greek education here comes back again, and you understand it for the first time; all my old Greek readings return to me now as realities. The old sites are so distinct that you have no difficulty in re-peopling Athens as of old. These Greeks were of gigantic intellect. Their mountainous country, with their sparkling seas, inspired them, and their free popular institutions. The associations as we stood by the Acropolis were overwhelming. I cannot wonder at the

enthusiastic patriotism of the old Greeks for their city. You should read Paul's address to the Athenians here, at this sacred spot.'

'Your mother and I are on our way back,' he said, when next he wrote. 'We shall soon be all together again.'

On his return, my father devoted himself with zeal for the next two years to the important work he had taken in hand, completed by the issue, in 1885, of the *Uranometria Nova Oxoniensis*. The attempt to determine accurately, on a novel principle, the apparent magnitude of all fixed stars visible to the naked eye in more than half the entire heavens was an undertaking of no light order, and we heard of little at that time except 'the relative brightness of the stars.' I remember how night after night he would beg my mother and us to come out with him and compare the brightness of the twinkling orbs up in the sky. After a time we became more expert in this task, and at last were even able to assist; but my father's eyesight was, I think, keener even then than ours, 'because I have really used it,' as he was wont to explain.

While engaged on this work, he snatched a brief summer holiday at the English lakes, a country which aroused in him many memories of the far-off days when, during his Clapham holidays, he had had as companion in the self-same spot the idol of his boyhood, the poet whose skill has immortalised it. 'I knew him as a man, studied him as a poet,' he said to us once. And much of Wordsworth's poetry father knew by heart; he did all he could to instil the same admiration into us, but I am afraid the half-holiday hours we spent over 'The Excursion' were not regarded by us quite so favourably as he expected. What was to him a recreation was to us a task. Our Sunday afternoons, too, when we were children, had to be spent on the study of Wordsworth. Later on, when we were children no more, these Sunday afternoons were set aside by my father himself for the recep-

tion of a certain number of special friends—a custom only gradually admitted, for he was by early education a very strict Sabbatarian.* But, little by little, he gave way, and ended by looking forward to these visits. It was, indeed, not easy to see him alone on week-days without interruption, and the Sunday receptions came to be attended by many intimate friends, old pupils like Sir William Herschel, neighbours like Professor and Mrs Presswich, the Rev. E. Ffoulkes and Professor Sylvester; in later years, also, Professor Max Müller and Professor Nettleship. Referring afterwards to these visits, Sir Henry Acland, a guest ever welcome in my father's study, wrote :—

‘Great as was his age, your father's loss is to me, and I feel sure to all, irreparable. I never saw him but with the deepest interest, instruction and respect. . . . His tender kindness, his cheering geniality, the breadth of his views, boundless kindness to me at all times, will never be forgotten by me while I remember anything or anybody.’

Another constant visitor on Sundays was Lord Tennyson's niece, Miss Agnes Weld, who had been known to my father from Freshwater days. Of his conversation with her on these occasions, she gives the following reminiscences :—

‘With my hand upon the latch, “Bob” started up from his seat at the Professor's feet, and his last notes of welcome having subsided, and the knowing animal curled himself up to sleep on his master's desk or easy-chair, the Professor would begin, if it happened to be term time, by asking me to give him a *résumé* of the morning's university sermon, which he would criticise at considerable length, making it a text from which to unfold his own views on religious matters, which were characterised by the greatest possible breadth consistent with strict orthodoxy, a breadth to which he had gradually attained from the starting point of rigid Puritanism, to the

* I can remember, in 1837, his demurring to my writing a letter on a Sunday.—
E. O. WARD (his niece).

straitest sect of which, he used to tell me, his parents belonged, and in which he was himself educated. One relic of his bringing up he retained to the end of his life—his abstinence from work of all kinds on Sunday, and to this he was faithful, even at times when the Sunday rest involved a great press of mental labour on Saturday and Monday.

‘But he rested, not to make the Sabbath a day of gloom, but a time of leisure in which to pursue those theological studies which his scientific duties crowded out during the remainder of the week. Had there been more Sundays in the year, he might have finished the volume he had in preparation, the achievement of which, he believed, would have been of more value than all his scientific labours—a treatise on the gospel contained in St Paul’s writings. He often conversed with me on this subject, saying that, to his mind, the strongest possible proof of the trustworthiness of the four evangelists is contained in the fact that so much of what they taught was committed to writing by St Paul in epistles, whose genuineness has never been called in question, years and years before a line of their gospels was penned.

‘Though the keynote of his Sunday conversation was pitched in a grave and occasionally a minor key, his keen sense of humour often peeped out in some racy story that came in *à propos*, or some tale of the merry schoolboy pranks he used to play. The thought that seemed to make him the happiest in reviewing his past life was the direction for the good of themselves and their fellow-men he had been, by Divine aid, enabled to give to the lives of so many of the boys who were entrusted to him. Tears used to come into his dear old eyes, and his voice used to quiver with emotion as he spoke of his prayers with and for them at the time of their confirmation, and how abundantly those prayers had been answered.

‘I often regret that I did not jump at Dr Pritchard’s

repeated offers to be my teacher in Greek and geometry. He said if I could spare him an hour a day for five months—it was just like him to put it that way, instead of alluding to the sacrifice of his valuable time the arrangement would have involved—he would undertake that I should read Homer with pleasure at the end of that time; and as to geometry, he declared that if I would give him seven sittings he would indoctrinate me into that science, adding, “You’ll be astonished to find what common sense it invokes, and to find also, with M. Jourdain, that you have been geometrising all your life.”

‘He took the broadest possible view of inspiration, which he used to say he was by no means disposed to shut up within the covers of the Bible, but considered to be the motive power of every good and great ideal and work of the present day, so that God still speaks by the mouth of living men, not in the Church of England alone, but in the Universal Church. It seemed with him, as it was with one I knew in my youth, the late Lord Rosse, that the study of the stellar universe lifted him nearer to heaven itself.’

His Sunday evenings my father loved to spend in the drawing-room, listening to my mother’s playing on the organ, a very beautiful instrument of Bishop’s making, and presented to him by the maker as a token of affection. He had a great love for music, which—what with organ, piano, violin and violoncello played in concert or singly—held so important a place in our home circle that no account of his Oxford life would be complete without some mention of it. He took the deepest interest in our musical education, spending lavish sums of money upon it, and was proud to hear of any studies, whether in the practice or the theory of the art, being on foot. To him music had been not merely a source of pleasure, but an aid to reflection. This curious effect he has noticed in his *Annals*, and he told us that some of his work for the Royal Astronomical Society was prepared while listening to concerts at St James’ Hall. Music, he said, helped him to think.

In 1885 my father was elected to serve on the Council of, the Royal Society. But it was in the following year, 1886 that honours were showered most thickly upon him. In February his four years' labours at the Oxford Photometry were rewarded by the gold medal of the Royal Astronomical Society. On this followed what was, perhaps, in his own eyes, the highest honour of his life—the enrolment of his name among the very few Honorary Fellows of his old Cambridge college, St John's. With pride he would recall the day when, in his own words, 'I found myself invited to reassume, in a more honourable form, those intimate relations which, half a century ago, had existed between me and the venerable college where I had been educated and encouraged.' He appreciated nothing that fell to him above this. Much as he loved his adopted University, yet that love never interfered with or took the place of his love for his own Alma Mater.

Then in July of that same year his old pupils of the Clapham days gave that dinner in honour of their venerable master, to which reference has already been made.

The Dean of Westminster presided over this meeting, which was held at the Albion Tavern, Aldersgate Street, where nearly a hundred 'Old Boys' appeared to answer to the roll-call. For, as my father himself wrote shortly after :—

'Perhaps the most touching, and, to those assembled, the most memorable part of the proceedings, was the expression of the desire to have the old "roll-call" re-enacted, after the lapse of an average interval of a third of a century. Accordingly, each "Old Boy" stood up in his place, in order to show himself to such of his old schoolfellows as might remember him, and generally, with a voice well recognised, answered to his name in the ancient fashion, with "Here, sir," and his right hand upraised. Grisly beards and grey heads predominated, the former overclouding or concealing the features, but the voice remained. Shouts of welcome naturally prevailed at the several recognitions.'

'To say that the affair was a brilliant success conveys no adequate idea of this unique scene,' writes his cousin, from Carton Tower, Stoke Poges. 'The mixture of the humorous and the pathetic, the friendly greetings, the old stories, and even the old names, created an impression not to be described. Deeply touching was it to see Dr Martin carried upstairs in an invalid chair. Very amusing was it to hear the Professor accost a highly-respectable looking divine with the words, "Why, it's Hippo!" At first all were like boys on a holiday—the Dean, laughing and joking, addressing me as Fred, and taking me by the arm. After dinner, the muster roll was called, and grey-headed warriors, divines, judges, lawyers rose, held up their hand, and said, "Here, sir," amidst thunders of applause. The Dean made a charming speech. Then "the old man eloquent" began, "Old Boys,"—and the storm was something fearful—"there are supreme moments, which occur once or twice in a man's existence, when all the chords of his life are gathered into one. Here are assembled men of mature, almost maturest, age, who have won their spurs in the battle of life. These men are met together with one accord to give a loving greeting, in the evening of his days, to the man under whose auspices they started on life's rough road, and, if I may be allowed to say so, to express their recognition of those principles early learnt, and which have so far conducted them upon their way."

'At the conclusion of this interesting meeting,' continues his cousin, "'Please, sir, may I have my exeat?" came from many a voice, and we separated, not to meet again, perhaps, till the universal exeat be granted, and master and pupil answer to the roll-call on the last day.'

My father's success in this year met also with recognition of a sort which does not often attend scientific accomplishments at the present day. One of his warmest and most loyal friends at this time was Professor Sylvester, the occupant of the other Savilian Chair—namely, that of Geometry.

The following sonnet, from the pen of this distinguished mathematician, appeared in the *Oxford Magazine* :—

TO THE SAVILIAN PROFESSOR OF ASTRONOMY IN THE
UNIVERSITY OF OXFORD

‘ Pritchard ! thy name be lifted to the skies,
Who in the starry fields find’st pure delight,
To note each ray that gilds the brow of night,
And the near hour of severing worlds surmise.
Press on, where Fame’s sublimest summits rise—
Time’s stroke falls lightly on his sacred might,
Who ploughs from morn to eve his furrow right,
Then sinks to rest midst sunset’s gorgeous dyes.
Hail ! faultless herald of the bright-eyed throng,
Heir to the wand, once Tycho’s, to assign
What place and précedence to each belong—
While yet with watery ray yon Pleiads shine,
Or strew with sands of gold their hair divine,
Thy praise shall flourish in immortal song.’

CHAPTER VII

LAST YEARS, 1887-1893

By his Daughter, Ada Pritchard.

IN the speech recorded towards the end of the last chapter, my father, then in his seventy-ninth year, had described himself as 'in the evening of his days.' But the phrase, so appropriate to the age of the speaker, had as yet little application otherwise. For him there was none of the resting from labour which the term would suggest. He had completed, it is true, a particular line of work at the observatory, but only to commence another.

Nevertheless, the time was now at hand when the vigour of his earlier years began, on the physical side, though on that side only, to show signs of diminution. And from this time he became more than ever anxious that all grateful acknowledgment should be paid to his assistants at the observatory—Mr Plummer and Mr Jenkins. 'How can I ever repay them for their extra trouble,' he wrote to his pupil, Dr Spitta, of Clapham Common, 'especially as for years, owing to growing infirmities, I have never been able to look through a telescope.' This was two years before his death. For his senior assistant, now director of the Liverpool Observatory, Birkenhead, he cherished a sincere affection, which he expressed in such a manner as to leave no doubt of his feeling towards the man who, in recent years, was so very closely associated with him in his researches.

His work, indeed, was going on as energetically as ever, and much outside work, too, beyond the actual province of astronomy. For his interests in other subjects were legion. He gave a series of lectures about this time at the observatory, which were open to all. 'I shall not die content until I have awakened an interest in these matters among Oxford people,' he often said. The lectures were of a semi-familiar nature, and illustrated by original slides on the screen in the big lecture room.

With his usual interest in scientific movements, my father became an original member of the new British Astronomical Association. Fearing that it might not be financially strong enough to maintain its *Journal*, the general plan of which met with his approval, he suggested to the president the formation of a subscription list for its support. 'But,' as the *Journal* afterwards said, in mentioning the above, 'although this has not proved necessary, yet it illustrates the quick sympathy with everything tending to the promotion of science which Professor Pritchard showed.'

At this time, too, my father was giving an hour and a-half daily to the study of Hebrew, stimulated, perhaps, to this exertion by certain criticisms then appearing on parts of the Bible, which he wished to read for himself. In this study he persevered for about two years. At its commencement he writes to Sir W. Herschel:—

'I took a drive out to Littlemore, hoping, rather than expecting, to see you, and I missed you accordingly.

'I rather wished to see you on a question of Hebrew! There broke out recently a recrudescence of some old family troubles, and I thought that an effectual way of forgetting them was to occupy my mind with batches of ten minutes nine times a day at Hebrew. I once knew a little, a very little, about it. Nothing can make me a Hebrew scholar, even if I wished it, but it may serve a purpose. *You* must

remember some of your early difficulties in this intractable tongue, and I shall be thankful for a little useful information and direction. . . . I shall be glad to have another fructiferous talk with you !'

But these manifold exertions could no longer be encountered without fatigue. It was about this time that, in a letter to his friend, Dr Huggins, he says :—

'I do envy you and your wife fishing and sketching by the banks of the Thames. If I don't get some fishing, or something like it, soon, I shall be doubled up. Too many irons in the fire.'

All we could do to persuade him to take a rest we did. It was no easy task. But mother took the matter into her own hands and insisted we should winter away somewhere. Father really needed an absence from the daily round of duties he imposed upon himself at Oxford. Accordingly, that winter (1889), we went down to Bath, where the life presented no resemblance to that of Oxford. It was intended to be an absolute change; and so it turned out.

Writing to an astronomical friend about the place, he said :—

'This Bath has brought much to me. . . . Here came in a neighbour, Mr Hippisley, one of the most ingenious men I have ever met with; full of lovely contrivances of rough but effective work. We have been talking one thousand five hundred to the dozen, we two young ones. He is eighty-eight years old, an old Oxford double second, the best degree a man can take for his intellectual sake. . . . We are expecting a visit in a few days' time from an old college rival, the man who thrashed me in exams. sixty-one years ago, a certain Canon Whitley,* a cleverer man than I. . . . This Bath is evidently a receptacle of nona-

* Canon Whitley was Senior Wrangler in Pritchard's year. See the account of the examination in Chapter I.

genarians. Blomefield* is here. I have seen him several times. There are many interesting people in and round the city who interest me, and are full of kindness and hospitality. We do not find it dull. We leave here in ten days, what an hundred days, Deo Gratias. A flight rather than a holiday, for every day I have heard from Oxford about Parallax or Photographic O. G.'s, or,' he adds characteristically, 'my carnations or my daffodils—the medley of life.'

This visit to Bath was, in part, suggested by some failure of eyesight, not wonderful in a man of his age. Nothing in his physical constitution had been more surprising, up to this time, than his powers in this respect.

In a letter, dated 10th April 1889, he puts a P.S.—'Written without spectacles'—and enclosed a humorous specimen of handwriting, signed at full length, though he makes a slight mistake as to his age. He was then eighty-one, not eighty-two, having been born (according to a document in his mother's handwriting) in February 1808.

His acquaintance with Mr Hippisley, referred to above, ripened as time went on, and continued after we left Bath and returned to Oxford. A correspondence between the old country squire, 'a scientist by choice,' and the astronomer by profession, kept the two minds in contact, but 'we two young ones,' as father described them, did not meet again.

The letters which passed between them were quite touching in their youthful enthusiasm over problems which had been present to the mind of each for some sixty years. The rest and change to the Somersetshire capital did my father real good mentally, but whether it was having 'too many irons in the fire,' or from the more natural cause

* Mr Leonard Jenyns, of Bottisham Hall, Cambridge, who had taken the name of Blomefield, was the well-known naturalist, the friend and fellow-worker of Charles Darwin, at whose request he wrote on the *Fishes of the Voyage of the Beagle*. Before the appointment of Darwin as naturalist in the *Beagle*, the position had been offered to Mr Jenyns.

of his advancing years, his health seemed to us all to show sad signs of breaking up. His spirit and unflagging energy kept him, however, from giving way in any sense. But the summer following he had to renounce all kinds of exercise. In the autumn he writes to his niece:—

‘My “poor” foot, as you call it, is better at last, but it has not assumed its natural condition yet. Each day the girls take me out in my basket chair, Bob accompanying us, of course, running on ahead, or lying stretched his whole length across the rug at my feet. I miss your visits, but hope you are enjoying yourself. It is glorious weather here; we have tea in the arbour at the observatory every day. Your aunt presides, and we have people coming and going all the time.’

Of these afternoons of which he speaks in a mere passing sentence, others, who joined the circle there, have carried away memories perhaps of a less passing nature.

It was so unique a scene—the wonderful glow of the garden flowers, the wide stretch of park around, the towers and spires of the lovely city behind the belt of trees. Nor did the attraction of those summer afternoons lie in their framework alone; the surroundings were indeed something, but they were not everything. The charm lay, as a friend has since written to me, ‘in the central figure there, in the old white-headed man who bade us welcome to come and sit at his feet. Only *he* never put it like that. He would say, “Come and honour me with your company,” and the listening we gave *him* was perhaps no more humble than what he gave *us*.’ Alas for the treachery of memory! Would I could remember some of the conversations we had then, the spirit of which alone remains.

For so it is with us, his children, who were so much with him; our memories have played us false also. It is only the ‘spirit’ of those times that we remember. But perhaps it was not in the words alone, or the substance alone, it was in

the manner of the speaker that the secret lay. A manner which, if emphatic at times, was at others tentative; but the sincerity of the utterance, the simplicity of the nature revealed, were of themselves convincing; one recognised that what he said he felt, and what he felt he said.

Few things in life he loved more than the long hours in that sunny garden, to which so many letters to familiar friends refer. It was not a large garden, but it certainly was a lovely one in so far that there were flowers in profusion. Mullis, the factotum of eighteen years' standing, looked after all these, and was justly proud of his work. In the arbour, months after its owner had passed away from us, we found some old gardening memorandum books, horticultural diaries in fact, books to which my father gave a daily attention. In these were careful little entries to mark when the seeds were sown, when they came up, when the carnations were potted, or new daffodil bulbs planted. All and every entry such as the most zealous professional gardener could produce.

His love of flowers, which was shared in an equal degree by our mother, was deeply rooted in his being. 'I see quite as much to reverence in my garden as I do in my observatory,' he would say. 'When I see a lovely plant, I take off my hat to it.' This idea was indeed a favourite one with him. 'I recollect,' writes Mr Knowles, 'his taking me one night into his little study at home, after showing me in his observatory the fringes of infinity in the double star and nebulae, and, pointing to a gas jet above his table, saying that, to his mind, it was almost more baffling and overwhelming in its suggestiveness of the infinity of minuteness than the vast nebulae were which had just overwhelmed me with the measureless dreams of infinite vastness. He said that his mind reeled when trying to follow the systems within systems of whirling, revolving atoms within that flame—deep underneath deep—quite as much as it reeled under the immensities of space.'

But greater after all than the wonders of the heavens and the earth, he would say, are some facts very near us, and one of the greatest of these is the human mind and brain.

In the autumn of 1890, with lessened physical energy, but though severely hampered in his health, active as ever in mind, he writes to Lord Tennyson :—

‘I am told that you are bringing forth yet much fruit in your old age : *longo intervallo*, I am in a similar case, and if life and liveliness be preserved till Christmas, I may hope to leave behind me, for students, an intelligible and rational account of disturbed elliptic motion—*i.e.*, solar, lunar and planetary theories—a tough bit of work, but highly useful if properly done, but *vita summa brevis spem nos vetat inchoare longam*.

‘I rejoice, and others also, in your advice of long ago that I gave my attention professionally more to astronomical matters than matters theological, but my interest in the latter is supreme as ever. . . . I am, myself, as I have said, enabled to work with some effect in celestial photography and photometry—the new astronomy. In fact I am, I believe, well in advance and in the van.’

In the desk at which he had written for forty-five years of his life, among masses of heterogeneous papers, I found, after the writing-table had ceased to be used by its owner, an old record, jotted down in haphazard manner, of a day’s work of that period of father’s life. It was headed :—

23RD JANUARY 1891

9.30. Down to the study : memoranda—left hand almost unusable.

10. Massaged.

11-12.30. Consultation with practical engineers about a new delicate measuring instrument. (Micrometer.)

1 P.M. Lunch.

2 P.M. Taken in bath-chair to observatory to see about preparation for lecture. One and a-half hours.

3.30-5 P.M. Odds and ends. Dozed. Wrote to my brother John.

5-6 P.M. Massaged.

6.30 P.M. A hasty dinner.

7.30 P.M. Went to observatory and lectured from

8-9.30 P.M. Lectured in bath-chair. Home. Tired.

Very seldom it was that father was ever heard to admit that he was tired; neither through the long course of that active life was he ever known to have a headache. The letter 'to my brother John' mentioned above ran as follows:—

' OXFORD, 23d January 1891.

' MY DEAR JOHN,—I was glad to see your handwriting again, and as you think you will be interested by tidings from me, I proceed to send them, cutting out all that may not be *couleur de rose*. Firstly, thanks, deep and great, to the Great Father, we are all in good health. All have escaped colds here this dreadful six weeks of arctic winter. The girls have been incessantly skating, chiefly on a small lake in Worcester College Gardens. The youngest, Lily, by dint of hard work and a certain natural gracefulness, has made herself an accomplished skater, so she more or less presides over young Oxford, who meet on the lake. She has been elected into the International Skating Club after trial of her skill. (My girls' skating was commented on eulogistically in the *Queen* newspaper.) . . . She is kind to others, as they all are, and not *conceited*. This is the same girl who two summers ago swam across the broadest part of Windermere. All this is pleasant and healthy to think of. The other three, Rosie, Ada and May, are all well on in various accomplishments; they are all singularly bright girls. Rosie sings in Balliol Hall some Sunday evenings; Professor Jowett openly expressed his admiration the other day. She sings sacred songs from

Handel, etc. Ada paints and draws well (exhibits), has made a study of both; and May, too, who plays the organ and does many things, and does them well. You ask for pleasant news, else I would not refer to these, as savouring of boasting—to me they are simply topics for hearty thankfulness for the various privileges. Rosie is filled with desire for active life, and she tried nursing at St Bartholomew's Hospital; she greatly liked it, but the life was strangely hard and rough—walking to the hospital dormitory a mile at night, and *in all weathers*; very absurd; so she gave it up reluctantly. They do better there now. She has had some literary work connected with the hospital world offered her in London, which she commences to-morrow. Her education has been magnificent, and she has seen much. My son Eric has all but finished his education at St Mary's Hospital, and takes his M.B. and M.A. degrees here after Easter. So here I am at eighty-two permitted to use and enjoy a great variety of interests of life. My *mind* ought to be a thank-offering, and I think often is. . . . My friend Perowne has been made Bishop of Worcester, and on Monday week he is to be consecrated in Westminster Abbey. Ada goes up with me, and all the family unite at dinner at the Westminster Palace Hotel. I go in a bath-chair to-night at 8 to give a lecture. We all unite lovingly.—Yours,

C. P.'

When, some months earlier, in the autumn of 1890, the news reached us of Dean Perowne's appointment to the Bishopric of Worcester, I remember my father's excitement. 'I cannot suppress the outburst of mind pent up within me. Why should I?' he writes to Canon Farrar* in reference to this. 'I rejoice with joy;' and in January, to the Bishop Designate, he writes himself:—

'MY DEAR FRIEND,—My dear wife says that I *may*

* Canon of Durham.

hope to attend at your consecration on February 2d, with caution,—so I hope. To me it will be deeply touching; you . . . and in Bradley's Abbey. Such is the course of Providence, wherein "the thoughts of many hearts will be revealed."

'So I have written to Bradley to ask him to make things smooth and convenient for me if it can be done. One of the girls will go with me. . . . We shall be at Westminster Palace Hotel. Then I would get home again with all speed and thankfulness.—My dear Bishop, yours affectionately,

'C. PRITCHARD.'

During the early part of 1891 the state of his health for several months caused us great anxiety, though he himself did not seem to realise what serious grounds we had for our fears, but preferred to contrast the happiness and comfort of his own lot with that of too many of his neighbours.

In the long watches of one of those anxious nights in the winter he said to our mother, who had been reading aloud to him, 'How thankful one must be for the mercies vouchsafed us. Think of the misery and illness around in poorly-conditioned homes. I shall like to make some thank-offering to GOD for the merciful winter I have passed through.'

In March, in answer to a hearty request that he should attend the Gaudy at St John's College, Cambridge, he writes:—

'How I wish I could personally join, my dear master, in the fray to-morrow. My whole *spirit* will be in Cambridge, but an octogenarian just recovering from illness must stay at home a bit. . . . Again and again, warmly and consciously, I feel grateful for the "all round" education given me years and years ago at St John's College.'

All through that time of illness and 'recovering' to which

he alludes, he had been nursed and attended by our mother, to whose care, perhaps rightly, he attributed his ultimate recovery; but in the early summer, before, indeed, he had been able to go about himself, and when his eyes were yet in bandages, she of whom he ever spoke as 'his sweet wife' was taken from the happy home circle at Keble Road.

Very suddenly and with but little warning this happened, and we dreaded what the shock would be to him to whom she had ever been a right hand. To distract his thoughts at this saddest time my father set himself to work. He declared that work after a while would help him, and in the quiet time which followed he completed an elaborate paper on the 'Diffraction Effects of Gauze Screens, Photographical and Visual.' 'My little bit of an observatory has turned out some work,' he remarked later on.

He lectured three or four times in that October term; going to and from the observatory in the bath-chair which had by now grown a familiar spectacle in the parks. Three sunny months at Hastings after Christmas worked wonders in his health—in fact, almost completely restored it. And I think we were never more astonished at his pluck than at that time when, with his eyes bandaged, he kept up a daily written superintendence of the observatory.

Mr Plummer sent the daily report, which we immediately read aloud to him, word for word. Then he would dictate back long detailed answers and directions from his bed, where, undaunted, he lay with his eyes all bandaged up. Dr Vickerman Hewland, who lived two doors off us at Eversfield, attended my father during that illness, and so successfully that, as he declared, 'I went back to Oxford in comparative youth. Not an ache nor a pain about me. I shall never be better than I am now. But my feet are not like hart's feet. . . . I have a lot of work before me, and I shall do it.'

But exciting as was father's own individual work to him he always found time to keep that of his friends also in view.

His own researches could not absorb him, nor entirely separate him from what was going on around him. Thus, in 1891, he writes to Dr Huggins:—

‘Any thinking and competent man must be delighted and astonished at your results . . . but don’t be daunted, there are two of you (you and your dear wife), a spectacle for men and angels. It is charming and epoch-making to see woman-kind asserting its power and natural gifts. Look at Miss Clerke’s book, just sent me, an excellent history, and one which will prove itself a useful one.’

And in his own nearer domain father had many instances of womankind ‘asserting its natural gifts’ as he put it. Among those at the observatory who were working under him in the final Honour School of Mathematics he had more than one lady student. For years previous to this he had been very much disinclined to credit the female brain with any *mathematical* ability. One or two women had stood out above their fellows, he admitted, but they were exceptions. Miss Caroline Herschel, for instance, whose name was most justly enrolled among the members of the Royal Astronomical Society, and of whom he would never tire of talking. And there was Mary Somerville; but still these were exceptions.

It was not till he saw them working, side by side with men, at the abstruse subjects under his own immediate direction that he recognised, and recognised in the fullest degree, that the capacity of the female brain was less limited than he had supposed. When the Astronomer Royal engaged lady computers to work at Greenwich, my father further freely admitted the expansion of his own views on the subject.

He took the deepest interest in his pupils, and would invite them to his house, and give them hours of his time beyond the mere ‘lectures’ demanded of him by the academic canon.

At these lectures, it should be mentioned, one small figure was ever present, in dumb, devoted attendance on his labours.

This was the dog Bob, his constant companion. In fact, they were quite inseparable these two. Bob was my dog by possession, his by adoption. During five whole years he regularly attended his master's lectures, sleeping right through them until my father's voice ceased, when Bob would get up and enter the bath-chair, which he knew well would conduct the lecturer home. Father had a very tender heart where animals were concerned, an especially tender one for Bob. The dog ruled, in fact, but I don't think either knew it; the master was unconscious of it, and Bob never took advantage; on one thing only he insisted—he must always and at all times be with his master. And so it happened that even at lecture times he admitted no break in the rule he had laid down for himself; only once was he known to miss his attendance, and that was not his own doing.

He was the lecturer's timekeeper, too, and one of a more assertive nature than the clocks which abounded both at home and at the observatory. On one occasion, at a crowded public address, Bob, who was sleeping it away on the platform, got up, yawned and stretched himself, looking hard at the speaker. 'My dog reminds me that my appointed hour is up,' father quickly added, and put a speedy termination to his speech.

Of course, Bob's master was teased about his love for the dog, and many a story is told at his expense on this head. The late Professor Minto, for instance, was the teller of one of these stories. It was on the occasion of an annual entertainment we gave in the big lecture-room at the observatory, to the employees of the G.W.R. My brother-in-law, Mr Chalmers Mitchell, brought Professor Minto, who was staying with him, but after his presentation to the host, Bob, to whom he remained a stranger, set up barking. 'This is my dear dog Bob,' father hastened to explain. 'We always bring him to the observatory with us, he makes our friends feel so *at home*;' the humour of which speech was lost upon the

speaker. Bob was completely on a pedestal. He, and he only, was allowed the free upsetting of the ink and gum bottles, or the scattering of the papers on the Professor's writing-table, and many a time have we seen father give up his own easy-chair to Bob, that he might make himself more comfortable.

This love of Bob was fully shared by the whole family, but my father's devotion to him assumed the most unselfish proportions. There is an old photograph still extant where master and dog are taken together, 'hand in hand,' as father gravely ordered it. Behind them both is the big black board, with its hieroglyphical figures, a background to 'throw Bob's white coat up.'

It was really touching the love of these two, and the faithful Bob has never allowed anyone to take his dear master's place in his affections—a place indeed not easily filled.

It was in 1892 that my father accomplished the second of the great researches carried out at the Oxford Observatory under his direction—the application of photography to the delicate and laborious work of detecting any parallax variation in the places of the brighter stars. 'Professor Pritchard was led,' it has been written, 'to restrict the number of observations made on any individual star, in order that more stars might be examined, his aim being to obtain within a short time a general estimate of the parallax of all stars to the second magnitude; and this object he attained. The idea of mapping out a research on such lines that it could be completed in a few years is characteristic of the professor, and although it may have originated in his own case, from the knowledge that the remaining years of his astronomical life, already a long and active one, could not be many, it is also particularly appropriate to a university observatory.'

But while this work, soon to be honoured with the

highest scientific recognition, was still incomplete, my father found time to throw himself zealously into the great international scheme for obtaining a photographic chart of the entire heavens, a scheme in which he was determined that Oxford should play a part. A letter, written early in 1892, and retranslated from an Italian newspaper, the *Voce della Verità*, with its accompanying comment, places the activity of the aged astronomer in a pleasing light.

‘THE ASTRONOMER PRITCHARD AND THE FATHER DENZA.

‘The illustrious English astronomer, C. Pritchard, director of the University Observatory at Oxford, one of the most hard-working cultivators of celestial photography, in sending some photographic proofs of the chart of the heavens to the Vatican Observatory, wrote to the director the letter which we here quote, which letter proves the uprightness and goodness of soul of the said astronomer, and shows how the study of the heavens, rightly understood, by itself alone, raises the mind to God.

“‘MOST NOBLE AND MOST REVEREND FATHER DENZA,—
In reply to your request I have begged Mr Plummer to send you an original negative of the catalogue as well as of the chart.

“‘I have also enclosed a copy of the negative of the Pleiades, with a complete description for those who are not astronomers.

“‘It would be for me a real pleasure, and more than a pleasure, if His Holiness, the Pope, would deign to bestow a glance upon this wonderful achievement of modern astronomy, showing him how the aspect of the marvellous group of the Pleiades is now recorded by means of photography. It might serve to divert the mind of the venerable Pontiff, even if only for a few moments, from his multitudin-

ous cares. And if that personage of great heart and goodness should be pleased to send his good wishes to our observatory, they would certainly be welcomed with gratitude. If you think fit to inform him of anything with respect to me, you may tell him that I am eighty-four years of age, and that I have myself now completed the measurement of the distances of all the stars of the second magnitude from our earth.

“This is not an astronomical letter, but, for me, it is a great pleasure to help Rome from Oxford. Many of us hope to meet each other in the celestial regions, beyond the stars, round the throne of God, where, merged in the eternal light, we shall lay aside all our differences.

“It may perhaps interest you if I further inform you that, many years ago, I was charged with the reception of Archbishop Manning when he took part in the periodical dinner at the Royal Astronomical Club. I was then secretary, and afterwards president of the Royal Astronomical Society.

“I wish you every good success in your astronomical work, and I remain, dear Father Denza, your most devoted,

“C. PRITCHARD,

“*Director of the Observatory at Oxford.*”

This letter was written at the beginning of 1892, and received the following courteous reply from the Pope:—

FROM THE POPE'S SECRETARY.

‘VATICAN, ROME, *March* 1892.

‘I am pleased to announce, honoured sir, that, conformably with your desire, Father Denza has presented your fine work on the Pleiades to the Holy Father, Leo XIII. He has admired and studied it with great satisfaction and delight. At the same time, he heard with great pleasure of the feelings that you entertain towards his person, and of the praiseworthy desire that you show

to help Rome from Oxford. Whilst His Holiness returns your feelings with a sense of sincere goodwill and merited esteem, he hopes from his heart that the observatory of Oxford may continue to be useful, as it has been hitherto, to the progress of astronomical science, especially under your intelligent care.

‘In manifesting to you these feelings and wishes of the Holy Father, I embrace, with pleasure, the opportunity of signifying to you my own most distinguished esteem.’

In the autumn of the same year my father’s Oxford labours were rewarded with the Gold Medal of the Royal Society. On hearing of the honour intended him, he wrote to the Bishop of Worcester:—

‘The news should come from me to you *personally*. This morning came a notification from the secretary of the Royal Society that a royal medal was awarded me for photometry and stellar parallax. . . . My friends may rejoice in this unexpected recognition (it seems almost like a dream) of an old man’s long-continued efforts. I began my astronomical work really at seventy! At eighty-four these are three hymns which I daily con:—(1) “Holy, holy, holy” (morning); (2) “Rock of Ages” (evening); (3) “Father, I know that all my life” (noon).’ He adds, ‘I am working in the Pleiades daily.’

My father went up to London to receive the medal, and with him my brother Eric and I, Eric being permitted to enter even the sacred enclosure of the Council Rooms at Burlington House with my father, who was on his arm. Lord Kelvin, in presenting the medal, dispensed with all ceremony, and himself descending from the steps of the dais, gave it into my father’s hand. He returned home the same day, as he did not wish to appear at the dinner which followed on the ceremony. Professor Huxley, who presided on the occasion, remarked that ‘there were two medals every

year, and they were usually allotted, one to physical and chemical science, and the other to biological science. They were usually given to younger men, and it was so in his own case over forty years ago. On the present occasion, the first of these medals was awarded to the present Director of the Astronomical Observatory in Oxford, Professor Pritchard, and he was told that there was no observatory in the three kingdoms in which so much admirable work of observation was being done. Only a short time ago the Royal Astronomical Society awarded its gold medal to the Director of the Oxford Observatory. He was further told that the Director was tackling what he understood was one of the most difficult pieces of astronomical work—parallax determination; and that he had already printed off more stars than anyone else. Besides this, he was hard at work on the great International Chart of the Heavens. It was obvious that this gentleman must be in the full vigour of youthful energy, and therefore he treated with contempt a rumour that had reached him, that the director was in his eighty-fourth year. (Laughter and cheers.) They would join with him in wishing Professor Pritchard a long continuance of the health and strength which were turned to such splendid account.’—(*Times*, 1st December 1892.)

Professor Huxley's kindly wish was, however, not to be realised. This was the last public ceremony in which my father took any part, except at our neighbouring parish church of St Giles', five months before his death where, he gave away his daughter May, on her marriage in December 1892, to Professor J. Bretland Farmer, of the Royal College of Science, South Kensington.

All who spoke to him on that occasion were struck with the vigour of his mind—a vigour which seemed almost to overcome the growing frailty of the body. His brightness and ready humour were conspicuous among all at that happy scene. His old friend, the Bishop of Worcester, was perform-

ing the ceremony ; his old pupil, Sir William Herschel, was at his side ; much there was to cause him happiness, and his interest in life was keen, perhaps keener than ever.

‘I saw him,’ writes the Bishop of Worcester, ‘for the last time at the marriage of his daughter May. He was then unable to move, except in his chair, but he was cheerful, and his intellect was as clear and his mind as active as ever. Indeed, he had been wheeled to the Observatory, had given his lectures during the previous term, and there was no apparent abatement of the interest he always took in his astronomical work. On this occasion some of his old pupils were present, and it was touching to note the affectionate homage which they paid to their old tutor.’

His health was now remarkably good, as, indeed, it continued for the remaining months of his life ; and if his ‘orbit,’ as he expresses it in a letter to his colleague, Professor Sylvester, ‘was circumscribed to the radius about the Observatory in the Parks,’ yet within that limit all was happiness. But for the one lost link in the home circle, father always said the last year of his life was the happiest he had passed.

And I think it was. The ‘orbit,’ of which he speaks to Professor Sylvester, was restricted only in geographical area ; socially, it presented a marked increase. For in his later life my father lost much of the inherent shyness which had characterised his earlier years, and became daily more sociable. The mornings, up to a week before his last illness, were spent in work, the afternoons he gave up to social intercourse ; and how good and kind people then were can never be forgotten by us.

‘There was no flagging of the mental powers,’ writes Miss Weld, ‘on the last Sunday I spent with him, less than a week before his death. He explained to me (in that lucid way of his which made difficulties vanish like magic) a technical point in crystallography, and talked of the progress he had been making in his work at the Observatory, which

he hoped would soon leave him sufficient leisure to finish that (to his mind) greater work on St Paul, which his heart yearned to accomplish. He went on to speak of his family in those terms of warm affection he habitually used of them. I thought I could trace a slight vein of sadness in his parting words to me, but so slight that I doubt whether he had any presentiment that this was the last Sunday he would pass on earth.'

After dinner every night, unless he lectured, we played cribbage; a game into which he threw his whole mind most earnestly, as though the winning or losing were to him a matter of real moment. A record of these games we entered on the cribbage board, and they present a vast array to the good on his side, for it must be understood that while he really enjoyed winning, he always thought it was through his own good luck that in two out of every three games played in the bosom of the family, success fell to his share.

About May we all noticed a change, a slight indescribable something that perhaps we did not acknowledge even to ourselves. The work at the Observatory tired him more; he often came home exhausted. But there was little in the symptoms that could cause any definite alarm on our part. He was entirely free from any anxiety himself. Of an afternoon he would see fewer friends, and his spirits were not so good, that was all. But by the end of the month matters had assumed a more definite form. The doctor and my brother Eric, who were both in attendance, recognised the gravity of his condition. He was mercifully spared a lingering illness, and his sufferings lasted but a week. We were with him throughout, as well as the old nurse and Mullis; and though for the most part he was unconscious, yet at times he showed a momentary recognition of us all, while Bob, lying at his master's feet, evinced a grief and understanding which were pathetic.

And it was on Sunday, Trinity Sunday of 1893, that

he passed away from us at the ripe age of eighty-five, and entered into the Sabbath of a well-earned rest.

‘The end,’ writes the Bishop of Worcester, ‘did not take him by surprise. He had long been looking forward to it. In a letter from him, dated 7th December 1881, written in answer to one in which I had asked him to preach in Peterborough Cathedral, he says:—

“Yes, I dare not, while life and voice remain, excuse myself from an invitation such as yours. So make it a late Sunday in Lent, when I am freed from lectures. My text *may* be—‘With whom is no variableness.’ It has been much in my mind and my thoughts of late. I find my old friends dropping off fast, and *here* all is abnormally variable. Yesterday my old friend Steel, of Harrow, was called away. He came here to *settle* after his retirement. Mine was the last house he was in before his death. He showed me a spot on his finger just lanced. I said, ‘Why don’t you go to London and see the best man? *I* should.’ In ten days he was removed,—a man of a free and generous spirit. I had said to him when he came, ‘Well, you are one of the very few men with whom one can interchange one’s thoughts’; and now—alas! So there is but One with whom there is no variableness.”

‘But he did not give way to sorrow. Healthy occupation and joy in his work were characteristic of the man. In the very same letter he writes:—

“My hands and my head are full of work, *Deo Gratias!* and I am sitting in my little room with much that is fairest on this earth before me. Garden, park, professors’ houses, Bodleian, Radcliffe, towers of All Souls, New College, Magdalen, St Mary’s spire, all before me. This *is* a fair earth of ours; fallen though it be, yet it is redeemable and redeemed. There is a joy in life: at present I feel it in the midst of more troubles and anxieties than I venture to let pass through my mind. What is it that makes me buoyant?

Humanly speaking, it is the thought and the knowledge of the order and the beauty of Nature ; occupation among the lights of heaven, and then there are the beautiful things that clothe the earth in profusion. Truly my spirit seems to leap among these and shout for joy. Thanks be to God that in youth I was taught the existence of Nature (which so many around me ignore), and then I learnt, as time went on, its glory and its orderliness. And I was taught and led to see a Father's hand everywhere, and never so plainly as now. There is nothing but the variableness of beauty there : no doubt there is the variableness of decay, but there is the budding and the new life of spring. In this way the light of God is reflected into the soul from the glory of His works outside. Would that I and all of us felt more of the Light that springs up from within, kindled by the Spirit of Him who is the True Light ! I did not intend this half-homily to you, but my old friend is called away, and so thoughts supervened, and I cannot help it."

'Gradually and peacefully the end came. There was no pain ; the intellect was clear almost to the last ; then there was a brief period of unconsciousness, and then the earthly career was closed, and the spirit which had so long pondered the mysteries of the universe passed within the veil, and beheld them with unclouded eye ; and the faithful servant entered into the joy of his Lord.

'As I write there rises before me the recollection of a singularly vigorous and original mind, a marvellous buoyancy of spirit, a lively sense of humour, an almost boyish joyousness of disposition, a warm and affectionate heart, a keen delight in the magnificence, the beauty, the variety of Nature, an ardent pursuit of knowledge in many and various branches, a love of literature, of art, of poetry, ancient and modern, as well as of mathematics and the natural sciences ; a perfect lucidity of expression, a transparent honesty, and all this controlled, sobered, animated by a devout reverence, and a sincere and

unshaken faith. To him there was no antagonism between Faith and Science. The God of Nature was to him the God of Revelation ; to him the Revelation of God in Christ was, in the deepest and largest sense, the interpreter of the world.

‘The loss of such a man is great, not only to the friends who loved him but to the many young and ardent spirits of our generation who are troubled and perplexed by what they are led to believe is the irreconcilable antagonism between Science and Revelation.

‘Charles Pritchard was a man of science. None could question the eminence in that field of one who made an important addition to the astronomical knowledge of his day, yet he remained to the last a humble, devout believer in Christ. Writing to me in January 1889, he says :—

“‘The Son of Man and the Son of God, one with the Father in some way beyond my conception and beyond the necessities of my being to know—I *don't know*, who does?—but I adore. I would follow Paul as Paul followed Christ, and ask no prying questions.” And again, a little earlier, “The best prayer you can offer for me is, that I may finish my course wisely and well, and always be ready to depart. I have seen enough of the vicissitudes and uncertainties of life not to ‘die daily.’”

At the Commemorative Service, the week after my Father's death, in the parish church, the vicar said :—

‘We have to thank God that again and again in the annals of our race there have been those who have combined the fullest knowledge and appreciation of the world's vastness possible to the human intellect with the sincere and devout conviction that God's thought and providence are in every part. Such were Pascal and Leibnitz in the first dawn of modern science ; such, in our own land, was the great Sir Isaac Newton ; coming nearer to our own day, such too was Michael Faraday, the electrician ; and as no un-

worthy follower in their steps, we in Oxford at least will not hesitate to add the name of Charles Pritchard. He passed away, as most of you are aware, last Sunday, just after you had been praying in this place that God would deliver him in the hour of death. Many who knew him but little will miss that familiar chair on its way to the Parks, where in his observatory and garden around it he loved to trace the Divine wisdom—equally manifest to him in the infinitely small as in the infinitely great. Those who knew him more intimately will long remember with affectionate regret the Christian kindness and the thoughtful sympathy of one who knew the better perhaps how to help and encourage others because his own youth and early manhood had been passed in the school of patient struggle and privation, in the school of long disappointment, of scant and tardy reward. On the other hand, for those who knew him neither as neighbour nor as friend, it may suffice to mention that for many years to come a portion of the standing work of every great observatory in the world will be to carry out the method for mapping out and measuring the heavens, in the inauguration of which he took an active and important part, so rendering to natural science a solid service of which Oxford may well be proud.

‘Amen ! Even so, with hearts uplifted by his words, we would bid him a last farewell. Farewell, Charles Pritchard ! Skilful astronomer, humble Christian, tender friend, faithful witness to the Truth ! Dear, right dear to thee were the counsels of thy God ! Through many a long day and far into the watches of the night, it was thy delight to count what might be counted of their mighty sum, to trace and treasure every token of the Almighty’s hand ! And, now, we doubt not, Death has been to thee the awaking to a nearer Presence and a clearer vision of thy God in the heavens, which are not seen but eternal.’

Theological Work of Charles Pritchard

BY THE

LORD BISHOP OF WORCESTER

THEOLOGICAL WORK OF CHARLES PRITCHARD

By the Lord Bishop of Worcester

IT is under a sense of sacred obligation that I have undertaken to contribute from my reminiscences to my dear friend's biography, and in particular to add a chapter with regard to his religious beliefs.

Writing to me just after Dean Stanley's death (in a letter dated Spa, 20th July 1881), he says :—' This reminds me of something. When my time of departure has come, will you render as true and unvarnished an account of me as you are able? May I leave you that legacy? You know almost all my foibles and some of my best aspirations. No one else does or ever did. I am seen with all my excrescences about me, and few get below the husk. Lord Hatherley and Hook and John Herschel entirely loved me; so I am so far solaced. Don't let me pass away without one word in behalf of my memory. I have long thought of writing this *to you*; perhaps Farrar* also knows a little of me. Stanley's death brings this matter practically before my mind's eye.'

I have already in the previous pages indicated here and there my friend's religious opinions; but as the deliberate convictions of a man of science, who not only occupied a distinguished position as Professor of Astronomy at Oxford, but had made important contributions to astronomical knowledge, they deserve something more than a merely incidental and passing notice. I propose, there-

* Rev. A. S. Farrar, Canon of Durham, and Professor of Theology in the university.

fore, in this chapter to give some account of Pritchard's attitude towards the great religious questions which have agitated men's minds during the last fifty years, and I shall do so first with regard to the movement emanating from Oxford which has left so marked an impress on Church life in England during that period; and next in relation to all those controversies concerning Nature and Revelation, and the authority and inspiration of the Bible, whether arising from the side of science or the side of criticism, which, in the minds of all thoughtful men, must possess the deepest and most abiding interest.

First, then, as regards the Oxford movement. As I have already intimated, he had no sympathy with it or with its leaders. He had no patience with the dishonesty which, as he considered, stamped it, even by the admission of the men themselves. In his letters to me, and in conversation, he often expressed his astonishment at the influence that Newman had acquired.

'What made Newman so great?' he asks. 'I mean great in his influence over some minds? I can discern few or no elements of the great man about his writings. To me they are subtle, and very subtle, scarcely sincere in their aspect. His surely must be an essentially weak mind which could be upset by Hume's arguments and seek for safety in the authority of the Church.'

Pritchard's estimate of Pusey was somewhat similar. Writing in 1878, he says:—

'Pusey's intellect is of a *subtle* order—not bright, nor wide, nor deep, but subtle, and now sacerdotally dishonest, a beacon and a warning to the mind theological. Don't suppose I am unaware that correlative pitfalls lie in the way of the mind scientific. I suppose that, apart from a growing union with the One perfect mind, all are more or less open to shibboleths and dogma.'

Then, too, as he had little respect for the leaders of the

movement, so he abhorred their priestly assumptions. He held that the very soul of the movement was sacerdotalism. His friend Hook (the Dean of Chichester) wrote to him in 1866:—

‘I do not hesitate to say that you have got the bull by the horns when you say that the top and bottom of the present distresses of the Church lies in that word *ιερεὺς*. This will come out fully in my next volume of the Archbishops, which will reach the Reformation. . . . The form in which this subject will come before me as an historian, not as a controversialist, is this:—I shall have to show that the whole principle of our Reformation consisted in changing the Mass into a Communion, whereas at present we find that the whole object of the Ritualists is to change the Communion into the Mass.’

This is striking testimony as coming from a High Churchman like Hook; but then he was a High Churchman of the old school, a High Churchman after the pattern of Andrewes and Cosin, not after the pattern of Pusey and Newman.

But besides this, Pritchard was indignant because he thought the proper work of the university had been lost sight of in the feverish controversies which so occupied men’s minds as to leave no room for anything else. Writing to me shortly after the publication of Mozley’s *Reminiscences*, he says:—

‘Yesterday and to-day I have spent on the Mozley *Reminiscences*. They lead me thoroughly into the Tract times and to some men whom I know or have known. Alas, alas, for poor Oxford! The things divulged speak not for her health. Not a word is there in all these pages redolent with the action of tutors, or speaking of tutorial work. The *raison d’être* of this noble university, the education of British youth, is therein, through the record of years, utterly ignored. Politics and polemical theology form the stuff and staple

of the history. We are a little better now, but the old leaven still heaves up. The whole controversy, correspondence and all relating to Keble, Newman, Pusey, Mozley, etc., leaves me more decidedly an Evangelical than I was, though softened, and more sympathetic for the historical and corporate aspects of the Church of England as they bear on the "High Church." Again:—"My mind is fearfully depressed at what I have been reading of Mozley's letters, and his friends. Try and wade through them; though a Cambridge man, they will let you into the pith or backbone of the activity of the Oxford "Movement" more than anything I know. It was for *The Church*, and not for the Christ within the heart of His flock.'

Somewhat later, however, he writes to Mr Ffoulkes to thank him for giving him more insight into 'Pusey's ways and thoughts':—

'But to me,' he says, 'Pusey and Newman are phenomena not wholly within the grasp of my conceptions; my own mind and culture have been cast in very different moulds. Pusey's way of writing was to me obscure—full of special pleading: so much so that I have at times been inclined to question his sincerity. You may readily suppose that I have never been able to sympathise with his appeals to the authority of ancient doctors. In my own line I can make at this moment a *catena* of astronomical doctrine which will not stand before more recent investigations, some of them my own, and not admitting of a question as to the modern results being nearer to truth than the old ones, yet neither old nor new *absolutely* true and exact. In Nature our knowledge is approximate; so also, I think, is our knowledge of Grace. Hence I can with difficulty sympathise with doctrines expressed in language which admits of no "shake," unless it be in the *ipsissima verba* of Scripture, that also admitting of an ever widening and deepening explication. So Pusey to me has ever remained a phenomenon out of or

beyond my sympathies or intelligence, *meâ culpâ* no doubt. So I feel indebted to you for your throwing more *couleur de rose* over the character and being of this remarkable man. The few remarks you make regarding Newman, side by side with Pusey, are in perfect accord with my own less mature judgment. *I* had almost rather doubt than be satisfied with and rest on the dogmata of Rome. The former is *me judice* a nobler form of mind, *εὐγενέστερος*. *Au reste*, I have no right to intrude my notions or judgment on you, but I may at all events tender you thanks for your (to me) deeply instructive words in the Oxford paper. . . . Still, I do not see anything so very remarkable in a man retaining his convictions of the truth of Christianity throughout his life. For surely in many men, by God's grace, the religion of the Cross is their very inmost life, and no man questions *that*. The phenomenon of Pusey to me was not his uncompromising defiance of infidel tenets and suspicions (the Daughter of Zion laughs them to scorn), but it was partly this : here is a man who doubtless had Christ within his heart living and directing and communing there in utter personality and subjectivity, yet he ventured to "direct" souls in a Roman priestly sense (not simply as a minister of Christ), and he yearned and strained over a *material* Eucharist.'

But in controversies of this kind Pritchard took no open part. Naturally, the greater part of his theological studies lay in a different direction. The controversies respecting the character and limits of Revelation, and the relation of Revelation to modern scientific discovery, the possibility of miracles and similar questions had a powerful attraction for him. Invited on several occasions to preach at the gatherings of the British Association, and at Church Congresses, he availed himself of the opportunity to show that God's revelations of Himself in the book of Scripture and in the book of Nature were so far from being in antagonism that there was a real harmony and a vital connection between the

two. Thus his subject before the British Association at Nottingham was 'The Continuity of the Scheme of Nature and Revelation;' at Dundee, 'The Analogy of Intellectual Progress to Religious Growth'; at Exeter, 'The Testimony of Science to the continuity of the Divine Forethought for Man.' 'Modern Science and Natural Religion' was the title of the address to the Church Congress at Brighton in 1874; 'Aspects of Nature in relation to Miracles and Providence' of that at Swansea in 1879. At Dublin his subject was 'Scepticism and Truth considered in their Relations to the Progress of the Knowledge of Nature.'

But his most sustained and most eloquent effort in the same direction was in his *Hulsean Lectures*, delivered in Cambridge in 1867. The title of these was 'Analogies in the Progress of Nature and Grace.' This was one of his favourite themes. In the first lecture he traces, in a passage of splendid eloquence, the slowness of the creative process and the marvellous preparation during long ages for the coming of man, the future Lord of the earth, and the subtle and secret prophecy of his appearance, a prophecy which could not even have been guessed at till its fulfilment; and then he asks whether we may not reasonably expect a like slowness and a like mystery in the process of redemption and the work of grace. The passage will be found *in extenso* in the note at the end of this chapter.

There were some few papers and sermons on these and kindred topics which contained many valuable germs of thought, but it appeared to me that, scattered in newspapers for the most part, or published as pamphlets, they presented only a fragmentary and perhaps fugitive character. I accordingly suggested to him that in sight of the prevalent scepticism, and the mischief done to young minds by the arrogant and pretentious Agnosticism of certain authors, it might be well to collect those of his writings which he judged best worth preserving, and publish them in a small

volume. He was greatly pleased with the suggestion. 'That's a valuable and kind thought of me and for me,' he writes; and in a day or two he sent me a summary of the book. Besides the addresses and sermons to which I have already referred, he republished in it his article on the 'Star of the Magi' from the *Dictionary of the Bible*, a remarkable paper on the standing still of the sun and moon at Joshua's command in the battle of Beth-horon, and another on the 'Creation Proem of Genesis' (both of which appeared originally in the *Guardian*), together with some addresses delivered to working men in St Edmund's Church, Northampton. Nothing in these papers is perhaps more striking than the way in which he deals with the two miracles, the one recorded in St Matthew, the other in Joshua. The German astronomer Ideler, following a suggestion of Kepler's, had attempted to explain the appearance of the star which brought the Wise Men to Jerusalem as nothing more than a conjunction of the planets Jupiter and Saturn, which took place about the time of our Lord's birth. Pritchard goes carefully into the question, and demonstrates that a conjunction which would have made the two planets appear as a single star, even to a 'weak eye' (Ideler's gratuitously absurd assumption), was impossible, that no conjunction of planets could have been described as 'going before' or 'standing over' the dwelling in which the Young Child was, and that, if the narrative is true, then some particular star or meteor must have been created for the occasion.

Not less remarkable is his argument with regard to the miracle in Joshua. Here he examines the attempt made to explain it on purely natural grounds by 'the simple law of atmospheric refraction'; shows that such an explanation proceeds from an entire ignorance of the nature of atmospheric refraction, which could never produce the alleged effect; and then goes on, after having thoroughly examined the geographical features of the country, the position of the

two armies, and the place of the sun and moon in the heavens, to vindicate the supernatural character of the transaction. It must be observed, however, that he admits a somewhat important qualification. For he does not insist upon a literal suspension of the movements of the heavenly bodies, but only on 'a miraculous continuance of daylight,' which might seem to Joshua 'to involve the staying of the course of the sun and moon.' His words are—'To me the records are *in their general drift and intention* substantially true. In the case of the battle of Beth-horon, in which the very existence of the Hebrew nation was in peril, the narrative may be satisfied by the miraculous continuance of daylight, which, in a rude age, and to Joshua and his host, might seem to involve the staying of the course of the sun and moon.'

In a letter, dated 1880, to Miss Agnes Giberne, authoress of *Sun, Moon, and Stars*, and other works, he says, with reference to these and other miracles:—

'I believe in the reality of the New Testament miracles—for reasons which you will see alleged; and as my friend Dean Perowne writes to me, "You have made Joshua's miracle possible."'

Elsewhere in the same volume he goes more fully into the question of the credibility of miracles, and argues thus: What is meant by saying that a miracle is contrary to the known laws of Nature? 'Nature,' he says, 'is only another name for the sum of all created things, all that exist, or have existed, or ever will exist or can exist, whether in the universe of matter or the universe of thought, seen or unseen. You have indeed a scheme, a system, a constitution of things, in which, though the several parts manifestly cohere and interact with an astonishing connection, nevertheless is a scheme in which "it is impossible for us to give the whole account of even any one single thing whatever," "the whole account, that is, of all its causes, ends and necessary adjuncts—adjuncts, I mean, without which it could not have been."'

What do we mean, he asks, when we speak of the Laws of Nature? The expression is used commonly in a sense which he thinks is far too restricted. As commonly employed, it seems 'to limit the conception of law as meaning merely "a sequence," as it would do apart from a Law-giver. I regard it rather in this sense—I am placed in the midst of a vast scheme called the scheme (or plan) of Nature. Can I discover the laws or any law *on which that scheme is constructed* by Him who framed it?' By patient observation 'we find that certain circumstances, certain collocations of matter, for instance, or of the planets, recur again and again, and then we find that certain other consequences invariably ensue, and so far as such and similar collocations are concerned, we rightly conclude that we have at length discovered the plan, the law, the natural scheme after which this matter, or those planets, or those collocations or environments are so far constituted. And this we call a *Law of Nature*: a law expressing *so far*, and so far only, the will, the scheme of the Author of Nature. But of how few instances of things, and of how infinitesimal a part of Nature, have we discovered such laws. You may count them on the fingers of your hands. There are the laws of motion, for instance. Some of these we do know, for Galileo and Newton discovered them and taught them. And Joule in more recent times taught us the convertibility of motion into other forms of energy. And Young and Fresnel taught us a little of the nature and laws of light. And Faraday gave us some notion of the mode of action of electricity. And Herschel pierced through a rift or two of the veil which interposes between us and the starry vault. But you have now traversed the realms of certainty and of known natural law, and as for the rest of things, the law (*i.e., the scheme of the things*) is displaced by presumptive evidence, and probability alone becomes the guide of life.'

Then he goes on to apply all this to the case of Revelation :

—‘ If it pleased the Author of Nature to send us, His children, a revelation of things in which we are most deeply concerned, but regarding which the visible parts of Nature could give us no information ; if, on this behalf, there appeared upon this earth One who assumed to be a messenger from Heaven, and to know the secrets of the Most High ; if he claimed for Himself a Divine origin, and exhibited in His conduct a moral intelligence far beyond any that we conceive attainable by the children of men ; if He taught and lived as none other being ever taught and lived before or since ; and if, in the course of His ministry this Unique Being, appearing under this unique environment, claimed, and was said and seen to exhibit, power over the diseases of the body and over the elements of Nature, nay, over life and death ; could you, I ask, *under these unique circumstances*, and considering what the scheme of Nature has been shown to be, viz., to us illimitable and unknown ; could you, with any show of reason, reject the narrative simply under the plea that it was *contrary to the Laws of Nature ?* ’

As, therefore, it is impossible for us to make any such assertion with our finite knowledge, the whole question turns on the credibility of human testimony. Did the alleged occurrences really occur ? ‘ And the case is even stronger than this, when referred to Nature in her immaterial phase. For the wonderful works of the Unique Being are attributed to the force of His Word, and the energy of His Will : and who knows anything of the relations of the Will of such a Being to the motions of material atoms ? ’

The Person and His Mission were unique, and the ‘ whole environment belongs to a part of Nature hitherto undisclosed, and the laws which govern it were, and still are, unknown. Under this aspect, whatever occurred might be, or must be, essentially miraculous, part, that is, of the general scheme of Nature, but nevertheless a part of it hitherto not by us experienced.’

Finally, Pritchard insisted much on the power of the *Will* in this Unique Being. 'The power of the human will, nay, the power of all animal will, is as great as it is mysterious. By it we every moment introduce a force—a natural force—which overcomes gravitation in the motion of our limbs; we control the wills and the actions of other men; we "overcome kingdoms." The Christ of the Gospels said that His Will was the Will of Him that sent Him. Are there any limits to the power of that Will, other than the limits of Beneficence and Wisdom? What wonder then that at a word of His, other, and to us stronger, forces come into action, and so "the blind receive their sight and the lame walk, the lepers are cleansed and the deaf hear, the dead are raised up, and the poor have the glad tidings preached to them."'*

EVOLUTION.

He wrote to me:—

'I don't believe in Darwinism; I do not think any true mathematician could. Dear old Herschel vented his piercing ridicule on it. Phillips, our soundest practical geologist, in several walks I have had with him, assured me it had not a leg to stand on, when viewed in the palæontological light of geology; the evidence, he assures me, is absolutely against it.'

Not that he is afraid of evolution:—

'As to the evolution of man,' he says, 'not so much from a zoophyte or a monkey, as rather through zoophytes from the interaction of the atomic forces in a nebula; if such can be shown to be the order of Nature, that is to say, if such has been and is the Will of Him who ordered Nature, I bow and have no objection to make.'

For he holds with Butler that an intelligent Author of Nature being supposed, it matters not *whether He acts in*

* The above remarks are taken partly from his book, *Nature and Revelation*, pp. 152-156 and 216, and partly from his letters to me.

Nature every moment, or whether he *at once* contrived and executed his own part in the plan of the world. But, nevertheless, he thinks the theory lacks proof. He does not believe 'that any amount of evolution, extending through any amount of time, consistent with the requirements of our astronomical knowledge, could have issued in the production of that most beautiful and complicated instrument, the human eye. There are too many curved surfaces, too many distances, too many densities of the media, each essential to the other, too great a facility of ruin by slight disarrangement to admit of anything short of the intervention of an intelligent Will at *some stage* of the evolutionary process.' (*Nature and Revelation*.)

But it may be well to let him speak more fully on this subject; for it is a point of very considerable importance. In a note to his *Nottingham Sermon* (preached before the British Association in 1866) he discusses at some length Darwin's theory of 'The Origin of Species by Natural Selection.' After expressing his 'admiration of Sir W. Grove's philosophical acumen in grouping together the plans and operations of Nature under one felicitous term' (Continuity), and observing that 'he appears to have accepted the Darwinian hypothesis as explaining the origin of that continuity which undoubtedly exists in the natural world,' Pritchard proceeds to state why he is himself unable to accept that hypothesis, 'at all events in its length and breadth, without some reserve.' He says:— 'As an illustration of the general nature of the objections which I entertain, I will take an instance from that branch of physics with which it is my lot to be most familiar; the optical structure of the human eye. From the cornea to the retina, the eye is an optical instrument. But what an instrument! The computation of the curves and distances of the refracting surfaces in this instrument, and the assigning of the proper law of density for the several layers in its principal lens, would require the

application of a mathematical analysis, such as I hesitate not to say was never yet possessed by a human geometer. The mechanism required for instantaneously changing the forms and distances, and in one instance the magnitude, of its component parts, would require a handicraft such as never yet was possessed by a human mechanic. I say nothing of the chemistry required for the composition of the several constituent media. I presume Mr Darwin would admit that this description is not exaggerated. Now, let us attend to the process of "natural selection," by which this marvellous organ is said to have come into being. "I can see," says Mr Darwin,* "no very great difficulty (not more than in the case of many other structures) in believing that natural selection has converted the simple apparatus of an optic nerve, merely coated with pigment and invested by transparent membranes, into an optical instrument as perfect as is possessed by any member of the great articulate class," *i.e.*, as perfect as the human eye.† And next comes the mode after which this simple apparatus of the coated nerve, by insensible additions gradually but *accidentally* made, is said to be converted at length into the eye of man. "We ought in imagination to take a thick layer of transparent tissue with a nerve sensitive to light beneath, and then suppose every part of this layer to be continually changing slowly in density, so as to separate into layers of different densities and thicknesses, placed at different distances from each other, and with the surfaces of each layer slowly changing in form. Further, we must suppose that there is a power always intently watching each slightly *accidental alteration* in the transparent layers, and carefully selecting each alteration which, under varied circumstances, may, in any way, or in any degree, tend to produce a distincter image. We must suppose each new state of the instrument to

* *Origin of Species*, 1st edit., pp. 188, 189. † See Darwin's letter, pp. 93, 94.

be multiplied by the million, and each to be preserved till a better be produced, and then the old ones to be destroyed. Let this process go on for millions on millions of years. . . ." Now, we must here ask, What is this "power always intently watching each slightly accidental alteration?" A few lines further down in Mr Darwin's page we read: "NATURAL SELECTION will pick out with unerring skill each improvement." But what is this "Natural Selection?" We must here take Mr Darwin's own definition: "This preservation of favourable variations, and the rejection of injurious variations, I call Natural Selection."*

'Now to me there appear three objections, which indispose me to accept the above description of the processes by which the human eye could have been formed, and I will state them as succinctly as I can. First, consistently with such knowledge of optical combinations as I happen to possess, I cannot understand how, by any series of *accidental* variations, so complicated a structure as an eye could possibly have been successively *improved*. The chances of any accidental variation in such an instrument being an *improvement* are small indeed. Suppose, for instance, one of the surfaces of the crystalline lens of the eye of a creature, possessing a crystalline and cornea, to be accidentally altered, then I say, that unless the form of the other surface is simultaneously altered, in one only way out of millions of possible ways, the eye would not be optically *improved*. An alteration also in the two surfaces of the crystalline lens, whether accidental or otherwise, would involve a definite alteration in the form of the cornea, or in the distance of its surface from the centre of the crystalline lens, in order that the eye may be optically better. All these alterations must be simultaneous and definite in amount, and these definite amounts

* *Origin of Species*, p. 81.

must co-exist in obedience to an extremely complicated law. To my apprehension, then, that so complex an instrument as an eye should undergo a succession of millions of *improvements*, by means of a succession of millions of *accidental* alterations, is not less improbable than if all the letters in the *Origin of Species* were placed in a box, and on being shaken and poured out millions on millions of times, they should at last come out together in the order in which they occur in that fascinating, and in general, highly philosophical work.

‘But my objections do not stop here. The improvement of an organ must be an improvement relative to the new circumstances by which the organ is surrounded. Suppose, then, that an eye is altered for the better in relation to one set of circumstances under which it is placed. By-and-by there arise a second set of circumstances, a second *environment*, as it is termed, and the eye is again, by Natural Selection, altered and improved relatively to the second set of circumstances. What is there to make the second set of circumstances such that the second improvement (relative to them) shall be an improvement or progress *in the direction of* the ultimate goal of the human eye? Why should not the second improvement be a retrogression *away from* the ultimate organ now possessed by man, and necessary to his well-being? But all this suiting of the succession of circumstances is to go on, not once or twice, but millions on millions of times. If this be so, then not only must there be a BIAS in the order of the succession of the circumstances, or at all events, in the vast outnumbering of the unfavourable circumstances by the favourable; but so strong a bias, as to remove the whole process from the accidental to the *intentional*. The *bias** implies the existence of a Law, a Mind, a Will. The process becomes one

* On this subject of bias, see a highly philosophical review of ‘Quetelet on probabilities,’ in Sir John Herschel’s *Essays*.

not of Natural Selection, but of *Selection arranged by an Intelligent Will*.

‘In considering the state of things just described, we must also take into the account that the successive variations of the eye are said to be *accidental*. What, then, but a *constantly exerted* Intelligent Will could cause the occurrence of new circumstances so as to meet these accidental variations, and concur ultimately to produce a certain definite result, that is to say, an instrument possessing the necessary and truly wonderful contrivances of the human eye? But is such a process to be called Providence, or Miracle, or the Inversion of Providence?

‘Further still. Mr Darwin considers that the process of natural selection must have gone on for millions on millions of years, in order to have produced the results which surround us. It is difficult to assign any approximate limitation to the meaning of the term millions on millions of years. But in turning to page 287 of the *Origin of Species*, I find the author considers that the denudation of the Weald must have required some three hundred millions of years! This denudation is but a trivial process, indeed, compared with the mighty geological evolutions which have occurred between that denudation and the present time, and inconceivably trivial compared with other evolutions which preceded it. Mr Darwin says, page 489, “As all the living forms of life are the lineal descendants of those which lived *long before* the Silurian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that *no cataclysm has desolated the whole world*. Hence we may look with some confidence to a *secure future of equally inappreciable length*.”

‘If then we assign a period of one million of millions of years to have elapsed, during which natural selection has worked for the production of a human eye, we may presume we are within the limits contemplated by Mr Darwin.

'Now, I do not hesitate to say that this assumption is entirely out of harmony with the existing state of knowledge.

'For during the deposition of the Silurian strata, there must have been a deep ocean, and terrestrial things were then proceeding, Mr Darwin says, on pretty much the same quiet model as at present. But it has been rendered extremely probable by the researches of Adams, Hansen, Delaunay, Airy*, and some others, that owing to the combined action of the ocean and the moon, the length of the day has been, and is now, undergoing a constant increase.

'On reading Mr Darwin's enchanting volume, we seem to be, as it were, in the hands of a great magician, who leads us up and down Elysian fields, pointing out to us on this side and on that new aspects of things which, though true, were beyond the reach of our expectations ; nevertheless, when, as we hope, we are nearing the hill-top and getting a sight of the primordial genesis of organised beings, the chariot on which he has mounted us rolls down the hill like the stone of Sisyphus.

' " With hands and feet struggling, he shoved the stone
Up to a hill-top ; but the steep well-nigh
Vanquished, by some great force repulsed, the mass
Rushed again obstinate down to the plain.

.
Tall trees, fruit-laden, with inflected heads
Stooped to us ; pears, pomegranates, apples bright,
The luscious fig, and unctuous olive smooth,
Which, when with sudden grasp we would have seized,
Winds whirled them high into the dusky clouds." '

Odyssey, Book xi.

Pritchard, as I have said, was a devout believer in Christ. He had no leaning toward the fashionable agnosticism ; he accepted from the heart the miracles of the Bible.

'Did I tell you,' he writes to me, 'a grand thought ex-

*Add to these names, Professor G. Darwin, 1889.

pressed by Dr Caird at the meeting of the British Association in Edinburgh? It referred to ——'s arguments regarding the knowableness of God—something to this effect: If I assert the unknowableness of God, I assert my knowledge that He is unknowable, which is a contradiction in terms. And then the new creed is that this unknowable Being is to be treated with reverence; but how can I feel a reverence for what I know not and cannot know? He may be all power, or all unconcern, or all unapproachable greatness—or even diabolical, for aught I can know. What folly, then, to tell me that I must revere Him! And then he went on as you or I should go on: He *is* known in the image of Christ. And you know what would follow. It was grand to hear him set forth this before so many young, unbelieving savants. Now, can you tell me what makes so many *young* savants deists or theists in effect? I put it to this, partly: in old days savantship was difficult to attain to. A few choice spirits, under difficulties, did become men of true science: Faraday, Brewster, Davy, etc. To these add others with a grand Cambridge training, physicists before metaphysicians, men carrying weight, ballast, true knowledge, slowly acquired. *Now*, nothing is easier than to pick up a little chemistry, and a little of this and of that and so forth: hence a host of *soi-disant* savants, who fancy it is "the thing" to doubt. These are men who never learnt three books of Euclid nor a proposition of Newton.'

THE BIBLE AND SCIENCE

Every page of Pritchard's published works, every letter in which he touches upon these subjects, shows how profound was his reverence for the Bible. Gifted with a strong imagination, he had brought it to bear on his interpretation of the Bible stories to his pupils at Clapham. It was the same in his sermons: a few graphic touches put the scene and the

actors before the eyes of his congregation, before he proceeded to draw the practical lessons which the passage suggested. Writing to me, even in 1882, he speaks of the Bible as 'the vastest and most valuable and most permanent monument among the sons of men,' and hopes, if life is given him, to do something more for its illustration. But, at the same time, his reverence for the Book was no slavish reverence; he had no theory of inspiration; he was ready to admit whatever the facts, honestly looked at, compelled him to admit. Thus he wrote to me (in 1887):—

'I entirely agree with you as to the "divers manners" of the Divine teaching—myth, parable, history, example, prophets, etc., etc. We can only discern the manners by the facts. Hence we may learn from the Divine Vision of Creation, and the Divine Myth of Paradise and the Fall. But what about the intrusion of the "Giants"? How did they get into the Sacred Book? Are we left to sift *them* for the Pearl of Great Price?'

Still, he sees the need of caution:—

'Before enunciating the mythical, should we not most carefully enunciate the principle that God *may* and has taught us by "divers methods"? We—*i.e.*, theologians and "Fathers"—have taught exaggerated conceptions of divine inspiration in the Scriptures, and now has come "the Nemesis of Disproportion."'

But then again he insists upon it, that we have no right to discount the real essential worth of the Bible because of the difficulties which crop up. His own dealing with such problems as those presented by the first chapter of Genesis was quite in this spirit. He accepted it *ex animo* as a divine revelation, but adapted to the times and circumstances and state of knowledge of those to whom it was originally addressed, and therefore not necessarily in accordance with the discoveries of modern science, nor designed to be so.

He is 'thoroughly convinced that Genesis I. is a revelation, made to the child-man, of as much of cosmical truth as lay within the reach of his undeveloped capacity to understand, with the intention, or with a provision, for the gradual rectification of his conception of this cosmical truth, as his curiosity, his wants, his intellectual powers expanded. I once told —, at a clerical meeting that if I found a compatibility between Genesis I. and our present knowledge, it would be to me a very serious difficulty in my accepting Genesis I. as a divine revelation: and I mean this very seriously. For I do not find it to be the general method of procedure with the Great Father to provide His children with anything for the acquisition of which He has endued them with faculties equal to the task. He did not reveal to them spectrum analysis, which gives them greater particular insight into the constitution of the Cosmos than is afforded by Genesis I. But He did inspire His children with curiosity, perseverance and intelligence, all capable of development, and out of these inspired powers and faculties came at last the revelation of the analysis of light. It is all God's doing, and it is marvellous in our eyes. Hence I, for once, read Genesis I. now in my old age with a deeper reverence and a more admiring love than I did in the wonder of my childhood, when I believed the words to be literally true.'

In a letter to the *Guardian* (10th February 1886),* he explains at length the difficulties which stand in the way of the various attempts which have been made to reconcile the Biblical story of creation with the ascertained facts of science; and, still later, in a paper which appeared in the *Expositor* (appended to my Notes on the First Chapter of Genesis), he takes the same line:—

'Taken in its plain and grammatical sense,' he says, 'this majestic poem, if regarded as an account of creation

* Reprinted in his little book, *Nature and Revelation*.

in fact, contains statements which, to my apprehension, are irreconcilable with what we at present know of the constitution of Nature, and there is offered no appreciable hope, that I can discern, of a reconciliation from future discoveries.'

He then gives his reasons for thinking that this poem could not have been originally intended to give a scientific account of creation in its precise order or method or limitation of time. These are—(1) The statement of the existence of waters before the appearance of the sun ; (2) The clothing of the earth with fruit trees and grass, each bearing its fruit, before the creation of the sun ; (3) The successive orders or stages of creation occupying each one single day. There are other difficulties connected with the geological record on which he forbears to remark, and is apparently satisfied with the argument which Dr Huxley has adduced to show that no reconciliation is possible between Genesis I. and the facts of Nature so far as it is at present known. He is particularly severe on the attempt to harmonise by taking the 'days' in Genesis I. as so many thousands of years or indefinitely prolonged periods of time. No, 'one honest solar day,' he says (in a letter to me), 'must have been intended by the writer, and nothing else ; and as to a thousand years equal to one day, etc., it is all irrelevant nonsense : an evening and a morning day *cannot* be a thousand years—a non-natural interpretation dragged in to save a case. No, the writer in Genesis, whoever he was, *did* mean seven true solar days ; he did mean that the fruit trees were created on the third day, and the sun, moon and stars on the fourth. He did mean a good solid expanse—a firmament with waters above it and waters below it. Other interpretations as to the order, *meaning and intention*, are as non-natural as anything Newman even ever wrote.'

But with these difficulties staring him in the face, he refuses to regard the Genesis cosmogony as a merely human

invention or tradition. He is convinced that 'a superhuman element' runs through the poem 'from its beginning to its end.'

'It is not, and it cannot be, simply a mere tradition from antecedent generations. For the record in Genesis is *sui generis* in the world's history; in all the annals of literature there is nothing that approaches it. Not all the poets and philosophers that have ever lived could have combined their genius to compose the like of it in its succinctness, its concinnity, its majesty. The myths of Plato on the origin and destiny of things, wonderful as they are for their exquisite beauty, are utter childish babble when placed by the side of the Mosaic poem. All other cosmogonies add grossness to infantine senilities.'

In other words, Pritchard sees in this magnificent poem the human element as well as the divine.

'Things are so constituted,' he argues, 'that the whole truth in its absoluteness is never taught, and is never attained; the light is sufficient for the day, and often for that day only; and more light is generally attainable by a more diligent and skilful use of existing faculties and natural endowments. Further, the object of the poem seems to be to impress on a rude and primeval age, in a clear and emphatic manner, the Fatherhood of God over the whole creation, but its object was not to teach the order, the method, or the time in which that creation proceeded.'

He regarded the whole as a vision vouchsafed to some ancient seer:—

'To him the darkness of his own deep sleep was the "evening"; then came the divine panorama, or parable enacted, and then dawn, or "morning" of his waking, and so on with all the seven.' 'The *order* of the visions' he takes 'not to have been necessarily the exact order of the progress of the divine created work.' 'The man records what he saw in a vision, and it is so far ahead of any other old-world

conceptions, that I regard it as truly a divine intimation of as much knowledge as man then needed; but a vision, not *absolute naked intolerable truth*, the glare of which the mind's eye cannot bear, any more than Moses could endure the vision of God without a veil.'

Such a 'free handling' of the Genesis narrative, it may be supposed, was not allowed to pass unchallenged. Dean Burgon wrote a caustic reply in the *Guardian*, in which he contended for the literal truth of 'every word, every syllable, every letter' of the Bible; but it needed no refutation, and Pritchard did not trouble himself to reply. A more serious criticism, however, came from another quarter. In the *English Mechanic and World of Science* (26th February 1886), Pritchard was assailed by two writers, one of whom called in question his facts, quoting M. Faye, the French astronomer, against him; and the other, his attempt to accept the inspiration of the record while denying its accordance with the most recent scientific discoveries. So far as I am aware, Pritchard took no notice of his critics. But he had at least the satisfaction of knowing that two other eminent scientific men took substantially the same view that he did of the creation story in Genesis, and, like himself, believed that it could not be reconciled with 'what we at present know of the constitution of Nature.'

When I was preparing my Notes on the First Chapters of Genesis for the *Expositor*, I asked Sir George Stokes, at that time President of the Royal Society, and Dr Bonney, Professor of Geology at University College, London, as well as Professor Pritchard, to give me their opinions, in writing, with respect to the questions at issue. I had always felt that the weak point in all commentaries on Genesis was, that the writers, not being scientific men, their conclusions on these questions were valueless, and I accordingly determined to consult the highest authorities. These eminent men kindly allowed me to publish their letters to me. They were all

sincere and devout believers in the Christian Revelation, accepted cordially the inspiration of the Bible, did not even question its miracles, bowed implicitly to its authority in all matters touching human conduct, but they all held, nevertheless, though with some variety as to detail, that in the present state of our knowledge it was impossible to reconcile Genesis I. with science, and they all took practically the same ground, that it was no part of God's purpose to reveal scientific truth, much less to anticipate the discoveries which lie within the reach of man apart from revelation.

THE HIGHER CRITICISM.

Towards the 'Higher Criticism' Pritchard's attitude was anything but sympathetic. Still, he was prepared to make admissions:—

'Such a collection as the Bible, Old Testament,' he wrote to me, 'is open to any amount of insidious, ingenious criticism, and unanswerable questions unlimited in number: it is to be taken *as a whole*, with all its environments. Part of the confusion, I think, comes from the perpetual lapses of the people into the idolatries around them, so that they prevented the establishment of the various religious institutions foreshadowed in Leviticus and Deuteronomy.'

He is of opinion 'that an intelligent and reverential, yet fearless, honest and dispassionate investigation of the Old Testament books is required,' and he is prepared 'for considerable modification of the old orthodox conceptions and interpretations.' But he was never able to reconcile himself to the extreme views of the more thorough-going critics; indeed, it would not be too much to say he regarded these with alarm. This was in some measure due, no doubt, to his own habit of mind, which being intensely scientific, led him to distrust the critical methods, but partly also to the tendency, natural to all men as they grow old, to fall back upon

first principles, to cling to what they have found, by their innermost experience, to be true.

It must be admitted that he hardly did justice to the immensely fresh impulse given by the critics to the study of the Bible, and the fresh interest which it acquired indirectly, even when the conclusions of the critics were most glaringly wrong.

Writing so late as 1892, he says:—

‘My spirit has been a good deal “put out” by the (I cannot help calling it) disloyalty of ——. I admit all the alleged apparent difficulties of the Old Testament. I admit it is a literature and may have been redacted, but my mind and common sense revolt at the *conjectural* criticism which professes to have found a clue out of the labyrinth. I don’t believe with — that no Psalm is Davidic. I don’t believe the Book of the Law was a forgery, and I am strongly inclined to think the safest course, and the one leading the nearest to the truth, is to accept the divine books as they stand.’

And again:—

‘I want to talk over with you this so-called “High” criticism, or, in all cases, *conjectural* criticism, and in some, I fear, audacious. I trust the words of Paul and Jesus infinitely beyond the hypotheses of — and Co. I admit intense and immense difficulties, but very many of them arise from an utter ignorance of the environments of the cases in question. I have neither time nor knowledge to investigate the matter by myself, and I get distracted by the confident opinions of the divines, clashing like meteor stones and ending in fire and smoke.’

And he sums up by saying that he falls back on the words of our Lord and of St Paul—‘What said Christ and what said St Paul?’

‘As I read—(he is not a clear writer, nor is he, as I think, a clear thinker), the conclusion I come to is that

the books of the Old Testament, or many of them, have been *very* seriously, consciously, and in some instances largely and designedly interpolated, the result being that what an incautious reader might take as a veracious and continuous history is a mosaic, made up or compiled at various periods of time, separated from each other by centuries. No notice is given of the compilation, and even fifty years ago, was such a compilation even suspected? Now, the effect of such a state of the composition of the books destroys, it may be urged, their authority.'

In a similar strain he writes to Professor Sanday, who had sent him the syllabus of his Bampton lectures:—

'To Professor Sanday.

' OXFORD,
' 27th February 1893.

'DEAR PROFESSOR SANDAY.—I have to thank you for a copy of your syllabus of four Bampton lectures. Naturally I have read it with intense interest.

'It occurs to me that this modern criticism raises far more difficulties than those which it endeavours to explain or to remove. The methods pursued do not seem to me to resemble those which have been hitherto successful in revealing some of the secrets of the natural world; to me they bear the aspect of haste and conjecture—but I believe my mind is *open*; I try to keep it so.

'I presume facts show that the degrees and kinds of inspiration are very various; the divine afflatus coming and going as He wills—in wisdom and love no doubt. There we agree.

'I don't doubt our early preconceptions of the Bible were in various ways imperfect or erroneous; at present we have not the Bible of our youth, but chaos, and the attempts to illuminate that chaos have issued in the destruction of the faith of thousands—alas! I know many myself.

‘Our Lord’s appeal to “Daniel the Prophet” is involved in serious difficulty, and to my mind, the hypothesis that our Lord merely takes the current accepted notions as he finds them, is, in reference to this particular quotation, very difficult and hazardous. There are also other similar instances, as you know.

‘The account of “development” of the law by the priests and others concerned is very *trying* to old-fashioned or simple minds—I don’t think modern criticism has found the right clue yet.

‘You let down the Song of Songs more tenderly than I should be disposed to do—I think the forced interpretations of it by divines have not been wise . . . but this is not important. The source of the modern forms and directions of “criticism” is German, eminently German. . . . Their bias of thought is (in my mind) not generally conducive to thought. But I own this remark does not help on these difficult questions.

‘Search you will, and search you must, and I pray that you may be enlightened in your search. I suppose it is “your duty in that state. . . .” Meanwhile, and in the midst of the chaos, I shall keep my mind as that of Locke’s “Plain Man,” and use English common sense. I think Paul was an incomparably abler man than any modern critics or divines—his opportunities in many ways greater, and his intentions more “inspired.” So, as I am unable to trace out all, or any of the matters in question myself, I shall adopt his opinions, and they lead me to the Christ of the Gospels implicitly, whose words, as therein recorded, I accept as TRUE.—Yours gratefully, etc.,

C. P.’

The extracts which follow are from four letters written at different times to Agnes Giberne, authoress of *Sun, Moon and Stars*, to which Pritchard contributed a Preface.

' OXFORD, *Aug.* 1879.

' I have long long felt that the secret of the holy life lies very much in the looking unto Jesus—but therein looking very much into his own life and words as recorded in the Gospels—specially in that by His earthly friend. The bye-words—shadows of his spirit—observable to those who look for them to be found in the sacred narrative are simply marvellous.

' If you want a suggestive book on this subject, you will find it in Stier's *Words of Jesus*—six long volumes translated in Clarke's series—a glorious book to those who will set aside his long-winded discussions and get to the marrow and pith of the thing. I know no book like it—to me it has opened out veins of thought and stores of nourishment—indescribable—an exposition often of the mind of Christ in his daily life and conversation—memorable and salutary. And then there are words of F. W. Robertson's—never forgotten when once received—I hope you for your own sake will not be frightened at the writings of that man of God—I know his peculiarities as to the scheme of redemption, and I don't share his views—but some of his sermons are not equalled in our language. "The loneliness of Christ," the feminine side of His human nature—is grand and fructiferous. . . . I am rejoiced that words of mine in the Hulsean Lectures set your mind into motion—THAT was their object—to *suggest*—to originate thought in minds.'

' 1880.

' My greatest delight is and long has been philosophical divinity: to see the *way* of the Great Father in the conduct of the worlds—Nature in all its extent so far as we can at present see it—a great little way.

' My spirit *leaps* within me at the contemplation; I speak sincerely. But sometimes the thoughts are sad—as were the Psalmists, "I do see the ungodly," etc. But then I

have a distant hope (no more) that in some way—the Father's own way—the moral waifs may by moral means—possibly redemption and grace—yet come to cry Abba Father, “And all is cleansed when the marble weeps.” I don't say this is *revealed* to us! I am sure the contrary is not absolutely and unmistakeably stated. But such thoughts are not the business of life. . . .

In March 1890 he writes:—

‘My ditties to you remind me of dear old Dean Hook's packages to me—I have a lot of them—but he was a practical man, and avoided all such questions as mine.’ . . . (Writing concerning a geological work). ‘But does not the Great Father teach and inspire His children with truths or half truths limited to their capacities? *Has* He not done so? But then see what a door we open by the word *Relative* Truth, from the Author of Truth. Enough. I shall repeat to myself after this Miss Waring's hymn, “I would not have the restless will,” etc., etc. What a wonderful book the Bible is—what thoughts it leads to, read amidst the book of Nature.’ . . .

‘1891.

‘I see you adhere strongly to the old orthodox teachings of your childhood as regards the texts and texture of Scripture. Happy for you. I am a *LITTLE modified*; the *evidence* of a divine influence in the composition of the books is to me greatly enhanced by a modification of my views regarding the obviously human elements in the Scriptures. I see a “continuity” in the inspired and the cultured intellect in the Scripture and human histories; my convictions of a *Divine Revelation* are strengthened by the studies of my life—but my views of the *MODE* of it are a little changed.’

‘In matters theological it does seem to me to be a most

happy thing for God's children to take their Father's book, and read it by the living light of a sanctified heart—seeking *at first* for no other guide (but Him).

‘*But* we all have had environments from childhood and have them still, and the light from these environments gets reflected *to us*, little as we think it: in this way our notions are, many of them, not our own outcomes after all; and we can't help it, it is a law of our nature, and no doubt a wise one. God therein may be giving us *helps*.

‘No Christian I think, if isolated from others, and with the N. T. alone, could or would evolve modern Christian notions and arrangements: St Paul, I ween, would stare at our ecclesiastical Christianity. We are all in it and can't get out of it. So much for the absolute originality of your or *anyone's* conception of Heaven, etc.’

Note I.

THE SLOWNESS OF THE CREATIVE PROCESS

(From the First Hulsean Lecture.)

‘And now, for the purposes of illustrating our argument, I must ask you for a moment to summon forth that divine creative faculty wherewith God has lovingly endued us for the clearer apprehension of his manifold works. In imagination I must ask you to ascend with me some old Silurian hill on the primeval earth, ages upon ages before God had fitted it for the abode of man. Picture to yourself some mighty stream like the Ganges or the Amazon rolling its waters from far distant mountains into an ancient sea. You observe the broad interminable belt of forest which, stretching inland further than the eye can reach, rises in wild luxuriance from the swamps which fringe the stream. You may trace there the majestic pine, the graceful fern, the erect gigantic moss, fluted and towering columnar reeds, and a strange fantastic undergrowth, unknown to the flora of the age of man. The oak and the elm, the sycamore and the noble acacias of the west, you will not find, for as yet they are not created. There are no cattle grazing ‘upon a thousand hills,’ for God as yet has not clothed those hills with grass. In the thick jungle of these primeval forests you will not hear ‘the young lions roaring after their prey,’ for as yet there is no meat provided for such by God. Those forests are tuneless of the glad carols of the birds, for as yet ‘the herb yielding seed, and the fruit tree yielding fruit after his kind’ are not created for their food. Apart from the low croak of the reptile, and it may be the shrill chirp of many an insect, there is the hush of the silence of non-existence amidst those matted fronds, save when the voice of the Lord is heard in the thunder or the wind.

‘And if in the strength of this creative gift you still keep

your stand upon your watch-place for ages beyond your power to count, you will see nothing but the decay and the renewal of that interminable umbrageous belt. The ferns will fade, the gigantic moss and the columnar reed will shrivel, and the pines will decay and fall to their mother earth, but all this only to make way for another and more luxuriant growth. And so for ages.

‘At length the scene changes, and through some mighty pulsation, some throb of the earth’s bosom, ordained of God, you see the waters of the broad swampy margin deepen and deepen, and then pile upon pile of forest growth and forest decay are submerged and gone. But wait awhile for the lapse of years: I know not how many, for science as yet has found no unit for the measure of cycles such as these. Whatever the periods may be, the divine faculty within us concentrates and apprehends them all as but a whiff of vaporous time. Wait awhile, and then upon the broad silted margin of the everlasting stream piles upon piles of other forests again rise and decay, and by slow successive pulsations of the uncompleted earth in their turn disappear beneath the swollen tide.

‘Now if in spirit you saw all this, and only this, would you be able to decipher the meaning of the riddle? Would you imagine, for instance, that all this mysterious prodigality of decay was a divine elaborate contrivance for the production and storing of fuel for the service of races of beings yet unborn? As you witnessed the successive growths and submergence of those forests, could you foresee or conceive in what way such an arrangement of things could one day materially conduce to the development of the genius of intelligent creatures who were destined to be in remote futurity the last and chiefest denizens of the earth? And if some bright messenger from the throne of God stood at your side, and at the beginning of the vision had told you how, in other forests of far different growth, the fowls of

heaven would one day "make their nests, and sing among the branches"; if he had told you that cattle would graze upon a thousand hills, and that "by the springs in the valleys the wild asses should quench their thirst"; if he had told you that God would place upon the earth a being clothed in the majestic image of His own mind, to be the lord and master of created things; then I think that at the first you would receive the revelation, though in wonder yet in thankfulness of spirit, and you would wait in the fulness of hope for the accomplishment of the promise. But if the vision proceeded through incalculable time, and for ages you had seen nothing but what, for want of better knowledge, seemed to you an endless prodigality of waste, would you in your impatience be tempted to say, Surely that bright messenger of God spoke to me in parables; for I see nothing, and for ages I have seen nothing, but a constant inflexible uniformity of Nature; as for the grass which he told me was to cover the hills, and the thousands of cattle which were to fill the plains, all such creations would be inconceivable, miraculous interruptions of that Nature which for thousands of centuries I have observed unbroken in its course. And as for the advent of that being who is to be the lord of that new earth, "where now is the promise of his coming, for since the beginning of the creation all things continue as they were?"

*Note II.*PREFACE TO THE SERMON DELIVERED BEFORE THE
BRITISH ASSOCIATION AT NOTTINGHAM IN 1866.

I have already remarked how profound was the impression produced on Pritchard's mind by his early study of Butler at the university. It has left its trace on all his theological writings. That the God of Nature is the God of Revelation is the key-note, whether in undertone or in full expression, of all his published sermons and addresses. But it is perhaps nowhere more strikingly evident than in the preface to his Sermon before the British Association at Nottingham in 1866.

'This discourse was written at Nottingham immediately after the delivery of Mr (now Sir William) Grove's address to the British Association.* Those who had the privilege of then hearing, or who have subsequently read, Mr Grove's discourse, will at once perceive that his remarks on the System of Nature suggested mine on the Scheme of Divine Revelation. That eminent philosopher pointed out, with a graceful comprehensiveness peculiarly his own, how a Law of CONTINUITY pervades and embraces the whole physical universe, so far at least as our knowledge of it at present extends. There are no gaps, no sudden leaps in nature, he observed, probably not even in the interstellar spaces themselves. Modern discovery seems to indicate with more or less distinctiveness that the sun and the larger planets are in their turns succeeded by smaller asteroids, and these again by swarms of revolving meteoric or planetary dust; the position of many of these swarms being at least partially determined, and the times and places when they become entangled and inflamed in our atmosphere being accurately known. Saturn, again, has his systems of rings of meteoric matter, and it may be

* The late Sir William Grove was President of the British Association in the year 1866, when the Society met at Nottingham.

that the sun is surrounded by that mysterious substance from whence proceeds the zodiacal light. All these systems of matter moreover, are either identical in composition, or at all events contain many terrestrial elements in common. Naturalists also tell us that the same sort of unbroken gradation or CONTINUITY exists in the organic world ; species melting into species, they say, so that the further our knowledge extends, the more difficult it is to decide where one ends and another begins.

‘The evidence that such is probably the constitution of the things we see, was perhaps never more clearly and succinctly detailed than in the discourse to which I refer. While listening to this account of the constitution of Nature, Origen’s remark, quoted by Bishop Butler, could scarcely fail to occur to the mind of any person at all versed in theology, and it certainly occurred to mine. Butler, indeed, for the purposes of his treatise, somewhat narrows the scope of what that most philosophical of ancient divines intends to imply, for the version which he gives is this : *He who believes the Scriptures to have proceeded from the Author of Nature may well expect to find the same sort of difficulties in them as are found in the constitution of Nature.** Origen’s remark, however, does not appear to be restricted to the question of *difficulties* alone, but to include any and all generic relations of created things which may be discovered by human research. Had he spoken in the language of our day he would probably have said, “There is a *Continuity* between the Scheme of Nature and the Scheme of Revelation, as recorded in the Scriptures.”

‘In this point of view, and so far as the very restricted limits assigned to me would permit, I have endeavoured to show how the great scheme of redemption may be regarded as a grand continuation, or rather as the divine climax, of that system of intervention and vicarious suffering which not only

* *Analogy*, Introduction. See the original facing the Preface.

pervades the natural world, but without much merciful alleviation, that world would become a scene of hopeless misery. Butler, as is well known, has already shown the same thing, under the idea of Analogy, which I here present under the thought of gradation or continuity. I then proceed to show that faith in the Redeemer is a grand continuation also, or rather is the divine climax of that principle of trustfulness in each other, which forms the very cement of the social fabric. Lastly, I have given my reasons for representing the restoration or sanctification of man's moral character by communion with God, as in the main a sacred extension of that Imitative Principle acting through association, which it has pleased God to implant in our nature for many wise and moral purposes, and which in this case He adorns with His especial grace.

‘I do not pretend that there is anything essentially new in these thoughts; if there were, this very novelty would have been, to me at least, a sufficient reason for a very guarded reconsideration. But then the *grouping*, I believe, is new, just as the grouping of certain acknowledged principles in the scheme of Nature, under the term Continuity, is new on the part of Mr Grove. I think, also, that this mode of viewing the scheme of Revelation, as contained in the Holy Scriptures, is not without considerable importance. For surely it must be a matter of great interest to the Christian student, to see how each fresh accession of human knowledge which God has permitted (and as I think has intended) His creatures to make, regarding the natural world, not seldom serves also to illustrate and confirm our faith in that scheme of divine government or dispensation which is revealed to us in the Bible. It was mainly this consideration which induced me to select this new topic of Continuity as the proper subject for an address from the pulpit to the members of the British Association for the Advancement of Science; and I have to express

my gratitude for the patient and respectful hearing which they gave to my remarks.

‘It may not here be out of place to observe, that the word Continuity is not the only philosophical term for which we are indebted to Mr Grove. This term he has applied to the *plan* of Nature throughout its known extent ; but he has also proposed another word which groups together the *forces* of Nature in a singularly happy and expressive manner. These forces co-exist, interlace, osculate with each other ; they are capable of evolution in a definite manner, the one from the other. The associations of matter with motion, light, heat, electricity, magnetism and chemical action, are all (in the language of Mr Grove) CORRELATED, and within prescribed limits, are interchangeable in quality and in quantity. This CORRELATION of the physical forces may, I think, be regarded as, upon the whole, the most remarkable discovery since the discussion of the Laws of Gravitation by Newton ; and there are not wanting reasons to expect that even the attraction of gravitation itself may be found to be a link in the same physical chain. Now, since it is thus shown that the Divine Governor of the universe has seen fit to bind, in one bond of Correlation, the forces acting in that part of His dominions which are *seen* ; ought we not, in the spirit of Origen’s remark, to look for a similar Correlation between those principles or laws, which have their proper functions in that part of the Divine Government which, though *not seen*, is revealed ? If we seek for it, we shall find it.

‘For where do the laws of Providence, for instance, end, and where do the laws of Grace begin ? are not both of them phases of the same Divine loving care ? Does not the one presuppose the other ? And a similar remark holds good regarding the functions of Faith, and Hope, and Love, and Obedience. Is not Hope the twin-sister

of Faith? And is not Obedience the daughter of Love? * And what becomes of Obedience when Faith is under a cloud? And in the great scheme of Man's redemption, does not an apostle tell us that Justification and Sanctification co-exist and interlace? and may not this fact go far to explain the interminable and sometimes unloving discussions regarding their true origin and their distinctive functions?

'Hence the sagacious remark made by Origen some fifteen centuries ago, like the expressions of other comprehensive truths, proves to be prophetic, and reaches to us and embraces our children. And this leads me to observe how unnecessary and how suicidal is that timidity, not to use a stronger term, with which many religious persons, and, I regret to add, some divines among us, receive the successive disclosures of the constitution of natural things, which of late years have come upon us in thick abundance. Such timidity is *unnecessary*, because each new fact, each new truth, when fairly presented to the mind, if only it be a truth, cannot fail to become a new illustration of Him whom they know to be The Truth, and whom they profess to love. For my own part, and I hope I say it with no affectation, and I am sure I say it with no reserve, from the results of modern research, I have gathered additional reasons for resting in the simplicity of the ancient Christian faith, and in modern discoveries I have found many a new and unexpected trace of the Creator's majesty, of His power, His wisdom, and His love. Some instances of what I mean will, it is hoped, be found in the Sermon which follows these remarks. May I be permitted to say, that if the progress of knowledge shall, on a calm and impartial review, induce theologians somewhat to modify, here and there, a popular or hasty, or merely human interpretation of one or two

* See Wordsworth's 'Ode to Duty.'

portions of the Divine Revelation, then, judging from my own experience, I feel assured that, with this increase of intelligent perception of the Will of God, there must be associated the exaltation of our reverential love of His Word.

‘But it seems to me to be worth considering whether this suspicious timidity regarding science and scientific men, may not after all be grounded on an entire mistake. For after all, is it *true* that the pursuit of science has any inherent tendency towards religious scepticism? I would venture to ask whether Kepler, or Newton, or Leibnitz, or Euler, or Linnæus, or Cuvier, were sceptics? If it were not that obvious reasons forbid it, I could put, without misgiving, the same question in reference to the great majority in the long phalanx of living men, who are devoting God’s noble gift of genius to the elucidation of God’s works. I do not say that the fashionable Agnosticism of the day has not found some adherents among men of science, as it has found many among educated men of every class. But it is *pre-occupation of mind*, rather than science, which is, and ever has been, the prolific parent of scepticism and of indifference in religion. Are not the pre-occupations of high position, the pre-occupations of ambition, of literature, of money-getting and of money-spending, of conceit, of sensual habits, and even of idleness, at least as unfriendly to the hearty acceptance of the Christian revelation, as are the pre-occupations of scientific pursuits? I trust I am not guilty of speaking in a presumptuous spirit, if I venture to remark that enormous mischief has arisen from ill-judged, unmerited, and often very ignorant attacks which have been made upon the supposed tendencies of science, and the supposed scepticism of scientific men, from the pulpit, in religious circles, and in religious publications. It is agreeable to no man to be pointed at with the finger of

suspicion; and men of sensitive and independent minds will leave, and within my own knowledge have left, a ministration of God's word, not from any original distaste for revealed truth, but because they have found themselves, and the at least innocent pursuits they love, made the object of covert, and unkind, and ignorant comment. It can be no exaggeration to say, that such an alienation of any highly gifted and influential mind is nothing short of a public loss, and that, therefore, the timidity in question is *suicidal*.

'On the other hand, it cannot be doubted, and it may not be concealed, that there is a *reticence*, and I wish I were wrong in adding there is a growing reticence, observable in the writings of some able men, which is both disappointing and painful to religious minds. It is a reticence regarding that Eternal Father, Who, even on principles of natural religion alone, is the Prime Cause, and the Governor of that universe, the frame-work of which is the object of the researches of these thoughtful men. It may be that one cause of this reticence is, the natural reaction from certain violations of good taste and propriety, which at one time abounded in the (after all, well-meant) writings of second-hand writers and religious sciolists. It may be that another cause is to be found in the fact that these great writers have in their own minds intentionally distinguished the subjective from the objective, separating the things of sight from the things of faith; but whatever the causes may be, the fact remains, and as I have said, it is both disappointing and painful. I will only venture to add one observation more upon this subject, and I am sure that the great writers to whom with unfeigned respect I allude, will bear me out in the justness of the remark—and it is this; the giants of old, who were the pioneers of modern knowledge, the Keplers for instance, the Newtons, the Bernoullis, the Eulers of ancient fame, had no such reticence. Why

should the sons be more reticent than the fathers? In this behest I cannot do better than conclude with a few passages out of that magnificent Scholium with which Newton closes the *Principia*, and if I give the original it is because I despair of making or of finding a version which could reproduce the eloquence of Newton's words: —“*Elegantissima hæcce solis planetarum et cometarum compages, non nisi consilio et dominio entis intelligentis et potentis oriri potuit. Et si stellæ fixæ sint centra similium systematum, hæc omnia simili consilio constructa suberunt UNIUS dominio. . . . Hic omnia regit non ut anima mundi, sed ut Univerſorum Dominus. Et propter dominium suum, Dominus Deus Παντοκράτωρ dici solet. Nam Deus est vox relativa, et ad servos refertur; et deitas est dominatio Dei, non in corpus proprium, uti sentiunt quibus Deus est anima mundi, sed in servos. Deus summus est ens æternum, infinitum, absolute perfectum. . . . Non est æternitas et infinitas, sed æternus et infinitus; non est duratio et spatium, sed durat et adest. . . . Ut cæcus non habet ideam colorum, sic nos ideam non habemus modorum, quibus Deus sapientissimus sentit et intelligit omnia. . . . Corpore omni et figurâ corporeâ prorsus destituitur, ideoque videri non potest, nec audiri, nec tangi, nec sub specie rei alicujus corporeæ coli debet. . . . Hunc cognoscimus solummodo per proprietates ejus et attributa, et per sapientissimas et optimas rerum structuras et causas finales, et admiramur ob perfectiones; veneramur autem et colimus ob dominium. Colimus enim ut servi, et Deus sine dominio, providentiâ et causis finalibus nihil aliud est quam fatum et natura. A cæcâ necessitate metaphysicâ, quæ eadem est et semper et ubique, nulla oritur rerum variatio. Tota rerum conditarum pro locis ac temporibus diversitas, ab ideis et voluntate entis necessario existentis solummodo oriri potuit. . . . Et hæc de Deo, de quo utique ex phænomenis disserere ad philosophiam naturalem pertinet.*”

‘In the notes, I have given what appear to me valid

reasons, drawn from astronomical and physical considerations, why I cannot accept, to its full extent, Mr Darwin's Theory of Natural Selection, as explaining the development of the human eye from some greatly inferior organisation. If the arguments are correct, they extend to other organs also. In the strictures on this theory, I trust not a word will be found inconsistent with that respectful admiration which I, in common with most educated men, entertain for the author of some of the most charming books in our language. I hope, also, Dr Tyndall will find no just cause for complaint in the manner of my taking exception to some of his recent remarks on Prayer.

'The great mental agitation on subjects connected with Religion, for which this age is remarkable, so far from furnishing a reasonable cause for despondency, may fairly be viewed as a providential opportunity for learned and high-placed divines to exhibit and enforce such new aspects of truth as they may consider to have been overlooked. It was in this light that Augustine habitually regarded the controversies of his day. It is anathema, and not moderation in argument, that is a sure sign either of a falling or a weakly supported cause. In contending with an opponent, nothing is gained by that assumption of a tone of superiority or by that "look of offence which, though harmless in effect, nevertheless," in the words of the greatest of ancient historians,* "is troublesome and painful to those who endure it."

* Thucyd., lib. ii., cap. 37.

Astronomical Work of Charles Pritchard

BY

Professor H. H. TURNER, F.R.A.S.

CHAPTER I

INTRODUCTORY

AN endeavour to give some account of Professor Pritchard's astronomical career is beset with peculiar difficulty. Two kinds of knowledge are requisite—that of the biographer, and that of the astronomer. This primary difficulty is not at first sight an exceptional one; the biographer of an eminent man requires in all cases not only literary skill, but a technical knowledge of the work which filled the life he attempts to describe. In the case of a man of letters alone are the two sorts of knowledge identical; in all others the biographer must be chosen from one of two classes, which are in too many instances mutually exclusive—fellow workers who are well acquainted with the facts of the life and work in question, but are not perhaps able to convey to others their true or full meaning; and those who could ably expound and interpret the facts, but have not the leisure to spend in acquiring a complete knowledge of them.

It must be admitted that this obvious dilemma does not often become serious in practice; more especially in the case of men of science, when, so long as the facts are clearly stated, the manner of stating them may well be further disregarded. Another worker in the same field has generally acquired a sufficient familiarity with proper methods of stating such facts clearly—if only in publishing the results of his own work—to be a competent biographer. From this point of view I undertook, though not without many misgivings, to give some account of the astronomical life of

my predecessor in the Savilian Chair at Oxford. It was not, however, until I had begun to collect the materials, and reflect upon them, that I saw how inapplicable was the general principle above stated, and what an exceptional difficulty was to be encountered. It would *not* be an adequate account of Professor Pritchard's life to state clearly, whether in technical or popular language, what pieces of work he had accomplished. This would indeed be exceptionally easy in his case owing to his manner of work—his method of rounding off and completing a definite research, and leaving no straggling ends to be gathered together after his death.

Possibly this methodical habit may have been partly a result of his beginning his professional career as an astronomer at the age of sixty-two—it was more of a possibility to him than to younger men that each new undertaking might be his last, and this may have made him more careful to arrange for its completion in a limited time.

But these researches, important as they are in themselves, and admirable as the work of so old a man, must after all be accorded only a secondary importance. The pictures of Pritchard as a man of method, who added three or four well-shaped stones to the astronomical tower, and even of Pritchard as a veteran of youthful vigour, accomplishing more than men half a century younger, must be subordinated to that of Pritchard as a pioneer. It is not, after all, what he accomplished that should be here clearly stated; but what he was among men that should be depicted with the artist's skill. His labelled achievements and his astronomical life—his works and his work, if the quip may pass—are so distinct. They are separated, with but little straining of the facts, by an actual date, that of the building of the Oxford University Observatory in 1874. All his important researches (labelled as his, though he was ever the first to acknowledge what was due to his assistants, Mr Plummer and Mr Jenkins: he was

the architect, they the builders) were subsequent to this date; but his position as an astronomer may be said to have culminated just before it, when, after passing the Presidential Chair of the Royal Astronomical Society, and being elected Savilian Professor at Oxford, he persuaded the University to spend a large sum on an observatory at a time when the science was being more and more neglected in the sister University—the home of Newton and Adams.

A summary of Professor Pritchard's scientific work of the usual pattern would thus deal almost entirely with the period subsequent to 1874. If reference were made to earlier years, it would perhaps be chiefly to express surprise that one who ultimately showed himself to be capable of accomplishing so much, should have left little on record during so long. But from the other point of view—when we consider Professor Pritchard's relations to his fellow workers, and to the history of astronomy—the very meagreness of the record becomes of importance. How was it that a man of few actual achievements enjoyed so full a measure of the confidence of his fellow men?—a confidence in no sense misplaced, as the result abundantly proved; but derived almost entirely (as remarked above) from what he *was* as contrasted with what he *did*.

It is easy to remark briefly that Professor Pritchard was throughout his life a man of the most liberal sympathies; that whether as a schoolmaster, a divine, or an astronomer, his interests in enterprise and in the advance of learning were of the keenest; and that his place, ever among the pioneers, gave him his prominence and distinction. But to give an adequate account of a life of this kind obviously requires the technical skill far more of a biographer than of an astronomer. The readers of this volume have presented to them in another section the position occupied by Professor Pritchard as a divine; the same skill might well have been brought to the task of portraying his astronomical life. The central motive

is indeed the same in both ; the never-failing freshness and vigour of thought and action, which waxed rather than waned with the advance of old age. In their later years, most men acquire a gentle conservatism in their habits and ideas ; Professor Pritchard was just as ready a few years before his death to enter upon a completely new astronomical enterprise in the mapping of the heavens by the new methods of photography, as he was to examine the foundations of the Christian Faith.

It seems to me, therefore, that I may be allowed a few words of apology for undertaking the present task. Until it was undertaken, I did not realise how hopeless would appear, on nearer view, the attempt to sketch this career, especially in the earlier portion. Having undertaken it, however, it only remains to make the attempt as best one can ; this lesson, at least, is thoroughly taught by the study of the life before us. I must gratefully acknowledge the help given by Sir W. J. Herschel, who has very kindly entrusted me with a series of letters from Professor Pritchard to his father (Sir John Herschel) ; to Dr W. Huggins, who has similarly allowed me the use of letters received by him ; and of Miss Ada Pritchard, who has assisted in ways too numerous to mention.

It is disappointing to find that so few letters remain or can be deciphered. Letters, which can so often be left to speak for themselves, are especially valuable in the present instance ; but in many of the press copies which have been preserved the ink is so faded that the writing is quite illegible. It would be well if those who have charge of old letters, and especially of old copies of letters, could find the leisure to examine them at intervals, and have re-copied such as were fading, but worthy of preservation. The old copying ink of fifty years ago does not seem to be permanent. I remember noticing that many of the letters copied at the Royal Observatory, Greenwich, show the same signs of fading.

CHAPTER II

ASTRONOMICAL WORK AT CLAPHAM AND FRESHWATER

A SERIES of letters to Sir John Herschel, the replies to which have unfortunately not been preserved, affords almost the only recoverable information concerning Mr Pritchard's scientific life at Clapham in the earlier years. The first letter does not touch on astronomical points, but is of general interest. It indicates that the correspondence arose partly in the exchange of letters concerning a son of Sir John's (now Professor Alexander Herschel) who was at the famous Clapham Grammar School under Mr Pritchard's care; and partly in a common interest in some novel experiments which were at the time being made by Mr Gassiot—one of those wealthy amateurs who have done so much for science. The letters are not dated, but a hypothetical date has been supplied.

'CLAPHAM,
' *Tuesday* (1844?).

'DEAR SIR JOHN,—The day you mention is perfectly convenient to me and to Mr Gassiot. I propose, if quite agreeable to you, that you should reach my house on Monday next, a few minutes before six. We will then take a little refreshment and adjourn to Mr Gassiot's, where, I expect, we shall meet Faraday; at least, this is not improbable. I can very conveniently give you a bed on Monday evening, which very possibly will be more convenient to you than moving late in the evening.

'If there is any particular experiment which you would like

to see, Mr Gassiot and myself will, with the greatest pleasure, endeavour to arrange it.

‘*Apropos* of experiments, I hardly know whether you are aware that Fraunhofer’s lines are (many of them) visible through an indifferent prism without a telescope or dark room. I have seen 3 of them with a piece of glass off a lustre in my drawing-room with the shutters open.

‘I am rejoiced to say your little boy’s health has been upon the whole very satisfactory, and I think his progress hopeful.’

The next letter (dated merely July 18th, probably in 1848-50) refers to the purchase of an equatorial, and is interesting as showing the state of practical optics at the time. The price of a five-inch object-glass is now given in an instrument maker’s catalogue as about £25. Mr Pritchard writes fifty years ago :—‘I have received from Munich an object-glass 47/10 in. clear aperture which I have covenanted not to pay for unless it is pronounced by Mr Dawes quite first-rate (cost £40). So I shall hope. I presume it ought to separate ζ Cancri (distance 1"·2) or ζ Boötis. But what impresses me is the difficulty there seems to exist in getting an optician to *try* his instrument before he sends it away.’

A few years later he begins to wish for a larger object-glass, and shows an inclination to attack resolutely the practical problems of optics, to which later on he devoted much labour. We do not, however, hear any more of this project at the time, though the subject is recurred to later. Only one letter written to Sir John Herschel during the next seven years has been preserved—probably there were no others of importance—and this gives the briefest possible account of a visit to Rome in 1855. We will therefore pass on to three letters relating to the Total Solar Eclipse of 18th July 1860, which attracted so many observers, and Mr Pritchard among the number, to Spain. The event has taken its place in history as the occasion of the first successful

application of the photographic method to the representation of the chromosphere and inner corona; and fully to understand the letters and Mr Pritchard's enterprise we must recall, in some detail, the circumstances of this eclipse, which the rapid advance of photography, rather than the mere march of time, has rendered so unfamiliar.

On the occasion of a total solar eclipse, when the dark body of the moon has advanced over the bright disc of the sun, and completely covered it, there flash into view portions of the sun which are never seen by inhabitants of this earth except on these occasions. The corona, which has been compared to the glory round the head of a saint, is seen stretching in all directions from the black central disc of the moon, and close to this black disc reddish flames of very irregular shape are seen. We now know that these appearances, the 'glory' and the 'red flames,' the corona and the prominences, are parts of the sun, and form the permanent solar atmosphere, and that we only see them during total solar eclipses, because on other occasions the enormously more powerful light from the body of the sun obliterates all traces of them. We have further learnt to detect the prominences by the spectroscope when there is no eclipse, and hopes are entertained of ultimately photographing the corona without an eclipse. But in 1860 all that was known *with certainty* of these appearances was that they occurred during total solar eclipses; whether they represented real envelopes of either sun or moon, or were of the nature of optical illusions (were due, for instance, to the refraction of the sun's light by a lunar atmosphere), was not certainly known. The prevailing *opinion* was that both flames and corona belonged to the sun, and had a real existence; but it was only an opinion, not an established fact. We cannot do better than glance at the evidence for the character of the red flames as summed up in Grant's *History of Physical Astronomy*, published in 1852. Grant

shows, in the clearest manner, how it was surmised, but not proved, that these prominences belong to the sun. [His further speculations as to the real nature of these 'red flames'—which we now know to be portions of a solar envelope, and to consist of incandescent hydrogen or metals—have been swept away by the spectroscope, and are now only valuable as indicating the precarious nature of the conclusions arrived at in 1852.] These conclusions had not been seriously modified in 1860, for there had been no opportunity of revising them, no total eclipse of importance having occurred meanwhile. And while the question whether or not the red prominences belonged to the sun still awaited its final solution, a new question of a totally different kind had arisen in the supposed—though, as we now know, unreal—discovery of a new inner planet, revolving between the sun and Mercury, for which the name of Vulcan had been proposed, and which it was reasonably expected might, though generally lost in the sun's rays, become visible in the semi-darkness of an eclipse. The total eclipse of 1860 was visible from Spain, and thus specially easy of access. Seeing what important questions were awaiting settlement, we can well imagine with what eagerness observers flocked to the points favourable for observation. The three letters to Sir John Herschel, describing Mr Pritchard's share in this enterprise, run as follows :—

CLAPHAM,
'June 23^d, 1860.

• DEAR SIR JOHN HERSCHEL,—May I venture to ask your opinion and counsel regarding the eclipse. Your opinion on the what and the how of what I propose, and suggestions regarding what I may have omitted.

'1. I take the means of ascertaining latitude and longitude and time, viz., 2 chronometers, and a small altazimuth.

'2. A telescope (good) $3\frac{1}{4}$ aperture, 46 in. focal length :

mounted on a *very firm* tripod, so as to have a polar motion adjustable to any latitude.

‘The eye-piece is a diagonal of glass—one half polished glass, the other half polished silver (deposited by De La Rue), and capable of easy sliding when the totality comes on.

‘There is a fixed wire micrometer (a diagram is given of seven vertical and seven horizontal wires, of which four, the second and sixth of each pair, are thicker than the others, and form a square; see p. 228). The thick square holds the moon at Vittoria, and is 0·45 in. The powers are 30 and 40.

‘My object is to ascertain the time and place of first contact, and the time and place and *motion* (if any) of some one prominent rose-flame.

‘As this power is low, I propose to adjust a very light telescope of 2·25 in. aperature, with a power of 120 *on* the other larger telescope, with the view of seeing the form and details of the flames better.

‘This is *my* work. Only is it worth while to adapt any polarising matter to the little finder—to see if the red flames are polarised? And if so, what is the nature of the observation? Is it simply a double refracting prism, and to observe any difference of intensity in the two images?

‘My assistant takes a dry and wet bulb thermometer, a minm. thermometer and a black bulb in vacuo, a barometer and an actinometer. His work is the actinometer. Another assistant will be charged with thermometers and barometer.

‘My two friends, men of great intelligence, will be charged with observing general phenomena with the eye or a good opera-glass. The queries being written down beforehand.’

(The remainder of the letter refers to other matters.)

‘CLAPHAM,
‘July 28th, 1860.

‘MY DEAR SIR JOHN,—I venture to send you a diagram,

rough enough, to give you some idea of the eclipse as seen by me and my assistants (see p. 227). Of its *general* accuracy I feel confident, and you will judge on what grounds.

‘The assistants were railway engineers employed by the *contractor* in the construction of the works. I gave them a lecture on the phenomena to be expected, and on the mode of observing. Each selected his own work, and erected a plumb line over Sun’s centre, and calling the vertex 12 o’clock and so on round the imaginary dial. My own work was the telescope with the shifting glass diagonal, half of polished deposited silver and a beautiful compound wedge (parallel-piped) of neutral tint (Dollond), all working most admirably. So my image was the queer sort of inversion you can understand. Upon putting my observations side by side with those made by the eye and smoked glass, the coincidence was most satisfactory. There were three spots on the sun, one about 3’ long, the other two scarcely 1’, but so sharp were their practised eyes that they brought me the correct time of passage of the moon over the *three* spots !

‘The diagram I send you is as seen by *me* in my diagonal eye-piece. The following is a succinct account :—

‘The thick circle is the sun.

‘N the north is inverted to my vision.

‘EW the direction of (diurnal) motion as seen by me.

‘The thin black circle is the moon at the commencement of totality. The thin dotted circle is the end of the totality.

‘The following are results :—

‘The corona was distinctly seen *before* totality, and *after* the sun’s reappearance, all agree.

‘Venus and Jupiter for from 10 minutes to 20 minutes before and after.

‘The *brightest* part was about 2’ broad, a little more ; and then shaded off indefinitely.

‘The disappearance of the sun and its reappearance were

both undulating or beaded (but not interrupted). Of this I have no doubt . . . my focus was exact.

'Unfortunately my eye first caught the prominence (α). I observed it for perhaps a minute, but perceiving no change of form or position I looked round the corona and then saw (β). . . . (δ) was at first a dull white, then pale rose; presently I saw (γ) and (δ) assuredly not there at the first. Finally, at the reappearance of the sun I just saw a very bright point at the tip of (β).

'Put these observations together, and you cannot doubt the motion of the moon gradually disclosing or covering the prominences.

'No prominence much exceeded 2' in height; the colours were pale and unequal.

'A telescope is a bad tool to observe the eclipse with; hence I did not see the fasciculi A, B, C, D, but they were observed by three independent observers who "*minded their plumb line*" in accordance with the directions written on the head of each paper of instructions.

'These bundles of rays in the midst of light diffused among them, extended some half or more of the sun's diameter.

'Throughout the eclipse I kept my eye on enormous faculæ nigh to the sun's edge, but no prominence or fasciculi appeared there.

'Venus, Jupiter, Mercury, Saturn, Procyon, α Hydræ, Regulus and another star were seen.

'Shadows of trees unearthly.

'The light on the under part of clouds capping a mountain in N.E. light sunset on Savoy Mountains! The upper part leaden and ominous.

'Two small birds in their terror caught.

'Sheep dispersed centrifugally.

'Horses looked up and then—grazed.

"I offered a dog a crust, and he . . . *eat it!*"

(*Vide* a report of assistant.)

'The *smallest* print in the *Times* legible, after rubbing the eyes to get rid of the remains of *green* sunlight.

'My secretary wrote and read easily during totality without lamp. But the small *Times* print I now send you was best * visible when held away from sun and facing the clouds in the N.E. (illuminated by the corona?).

'The black bulb in vacuo fell 50°. 7 Far. during totality, the Spaniards stuffing themselves in the heather to get warm.

'A singular stereoscopic effect was observed by four or five of the engineers.

'The moon hung as it were in space—space between it and the corona—unquestionable.

.
'And now comes a matter which puzzles me much.

'52m. after the appulse, from the S. cusp P., absolutely from the apex, I observed a decided "*bright*" line PQ slightly inclined to the wire EW, and on each side of it suffused light. I shouted out, "Oh, that I could draw this." It continued from 2h. 34m. to 2h. 51m., latterly feeble. It could hardly be eye water on the neutral tint wedges, for I shifted it about from time to time, and the effect was too definite and decided and persistent. The suffused light on the moon was observed by others (?corona light). Captain Jacob did not see it, but had seen something like it on a former occasion.

'What think *you* of it?

.
'I think I have now told you all or the main. Comments from you I shall greatly esteem—or queries.

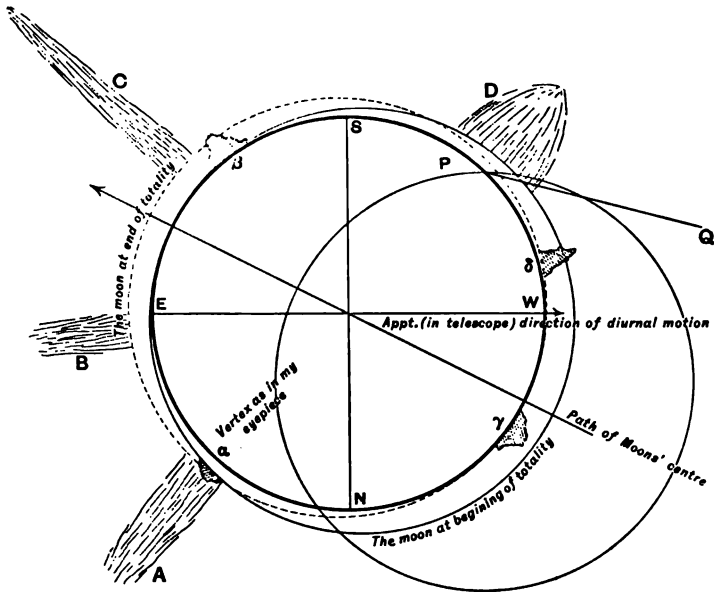
'My position on the wild height 2170 feet was magnificent indeed—a table land with mountains, rocks, villages, bold escarpments and valleys, etc.

'Weather—abominable, like Lancashire or Borrodale. I saw the stars *once*, and one sunny day in seven. Thermo-

* Query *least* or *best*; the MS. not clear.—H. H. T.

meter 91 in the shade, and next day 58 at maximum, actinometer useless, but rain gauge or mist gauge in requisition. The railway experience is 15 per cent. under average for work. Vignolles caught in a cloud, and Whewell but little better. He does not like to say so.

‘Please send back the print from the *Times*.’



PQ the bright line . . . and diffused light over the moon . . . 52m. after the first appulse.

D the broadest fasculus of rays from corona.

C the longest.

δ . . . much like a mitre.

β . . . the last seen of this was a *bright spot* just at emergence of sun.

‘CLAPHAM,
‘July 31st (1860 ?)

‘DEAR SIR JOHN,—For your letter, thanks ; but I did not receive the small print of the *Times*.

‘When you see our meteorological journal you will see how utterly impossible actinometer observations were—except on

one day when two or three series were taken, and then the instrument broke down from heat and leakage, but we mended it. The star I did not mention was *not* Vulcan, but a fixed star set down in the R. Ast. diagram.

‘Of the correct (approx) places of the four prominences, there does not admit a doubt, because I dictated to my assistant what I saw and in the order I saw—my telescope inverted, about the declination parallel in the centre of my field and was equatoreal.

‘Whereas my engineer assistants saw with the naked eye, plumb line and imaginary clock face micrometer.

‘My micrometer was arranged thus:—

	6,1	6,2	6,3	6,4	6,5	6,6	
	5,1	5,2	5,3	5,4	5,5	5,6	
	4,1	4,2	4,3	4,4	4,5	4,6	
E	3,1	3,2	3,3	3,4	3,5	3,6	W
	2,1	2,2	2,3	2,4	2,5	2,6	
	1,1	1,2	1,3	1,4	1,5	1,6	

‘I dictated the squares thus numbered, and they (*i.e.*, prominences so marked) entirely agreed with the places as marked by the engineers on the clock face hours.

‘Curiously enough, when I got to Vittoria Captain Jacob said, “Did you see the prominence like a mitre?” On my referring to the engineer’s drawing, *his diagram could not be mistaken for anything else but a mitre ! ! !* I should add my

assistants observed on a hill a mile from me (to divide the crowd of spectators).

'The stereoscopic effect was, to the vision of *many* beyond a doubt, "black ball suspended in space in front of the corona."

'Could my bright line be a part of the fasciculi of rays from corona?

'M. Foucault considered that he saw corona light half an hour before totality; so said he to me in Paris.

'I don't vouch for the *absolute shapes* of the prominences except the mitre; their *places*, I *do*. One was described to me as jagged and toothed and reaching from "12" nearly all the way to "1."—Yours ever sincerely, C. PRITCHARD.'

We gather immediately from these letters that the writer prepared for himself a simple and definite programme before his expedition; that he was favoured with fine weather at the critical moment, and carried out his programme; and thereby ascertained a definite fact, which added to our knowledge of the sun—altogether a most successful 'eclipse expedition' in every way. And yet I can nowhere find any published account of these observations, which are apparently here printed for the first time.

The fact is, the observations were rather thrown into the shade by the more complete demonstration obtained photographically, and hence were not put forward. Had the photographic method failed, however, they might have become historical.

A careful report of nineteen pages (folio) of MS. was written out, to which was appended the report of his assistant, Mr Vincent Fasel; and these MSS. were preserved. They have recently been presented by the family of the late Professor Pritchard to the library of the Royal Astronomical Society; as also a book of letters, sketches and photographs relating to the eclipse, collected by Mr Joseph Bonomi, who

was also a member of the expedition. These MSS. were apparently sent to Sir G. B. Airy to assist in the preparation of his general account of the Himalayan Expedition (Mon. Not. R.A.S., xxi. pp. 1-16), but are not therein referred to, and were never published. There is no reference to them in Mr Ranyard's Eclipse Volume (Mem. R.A.S., Vol. xli.).

But at the risk of being tedious I should like to draw particular attention to these observations of Mr Pritchard. He knew that there would be many observers, and he chose a very modest programme, but a thoroughly good and important one. His chief object was to 'obtain the time and place and *motion* (if any) of some one prominent rose-flame,' and thus obtain a definite piece of evidence as to the character of these objects. He succeeded in noting the behaviour of several prominences, and was satisfied immediately that the 'motion of the moon gradually disclosing or covering the prominences' could not be doubted; and that the prominences were of solar origin.

This fact was established much more completely by the photographs taken by that distinguished amateur astronomer, Warren De la Rue. He obtained two successful pictures during totality, agreeing in all details except for the advancing disc of the moon; and thus Mr Pritchard's observations were thrown into the shade. Recognising this fact, he did not publish them; and the only published reference I can find to his eclipse visit is a sentence in the Bakerian lecture given by De la Rue in 1862 on this total eclipse, which reads as follows (Phil. Trans., 1862, p. 357):—

'The time I could spare was far too short for any exact observation of the corona; however, I know that Mr *Pritchard*, Mr *Oom*, Mr *Bonomi* and other observers intended to make special delineations and measurements of that phenomenon.'

Even this sentence does not agree with Mr Pritchard's letters, for the references to the corona are meagre. 'It was distinctly seen *before* totality and after the sun's reappearance,

all agree. The brightest part was about two minutes broad, a little more, and then shaded off indefinitely;’ and of course there were the drawings which were made by the engineers who ‘minded their plumb line.’ The corona did not apparently attract much attention in 1860. Its time was not yet.

Some of the minor observations recorded by Mr Pritchard are of considerable interest, especially the ‘matter which puzzles me much,’ viz., the bright ray from the cusp some time before totality. Similar observations are rare, but not unknown. In the Eclipse Volume (Mem. R.A.S., Vol. xli.) above mentioned, Chapter XI. is devoted to the discussion of them. At this same eclipse Mr Buckingham saw a brush at the same cusp, but at 2h. 58m., six or seven minutes after it had disappeared to Mr Pritchard. Captain Jacob records ‘long coloured rays issuing from the thin crescent of the sun’ at 2h. 46m. Others saw brushes after totality. No good explanation has yet been given of these appearances.

I dwell at some length on these observations of the eclipse, partly because of their general interest, and partly because they seem to me thoroughly characteristic of Mr Pritchard. The undertaking was very definite, and originated with himself; but he took pains to get advice from the best authority he knew. Unfortunately Sir John Herschel's reply is lost to us. Further considerable ingenuity in devising instruments suitable for the purpose is manifested. The plumb line for the unskilled assistants, with the imaginary clock face, was admirably suited both to occasion and persons. The cross reticule with a simple enumeration of the squares was an excellent method of rapidly estimating the positions of prominences. There is no time to waste at a total solar eclipse. Such ingenuity was afterwards shown in the devising of the wedge photometer and in other ways. Finally we may perhaps say that the successful issue of the enter-

prise was characteristic, though this point obviously cannot be pressed, in view of the important part played by the weather.

After these eclipse letters, there is no other of importance written to Sir John Herschel until 1863, when Mr Pritchard was secretary of the Royal Astronomical Society. His astronomical activity entered on a new phase about 1860. We may perhaps date the change from 1859, when he was elected on the council. With his election to the Secretariat it became marked. It will be convenient, therefore, to conclude here the account of his earlier years before proceeding to the time when he was in full work for the society. The astronomical records of this first portion of his life are scanty, and the work done was not generally considered worthy of publication; but the few letters quoted show quite sufficiently the scientific enthusiasm and ability of the writer.

The printed record of these years is not, however, entirely barren. In the year 1853 Mr Pritchard contributed to the *Monthly Notices* * of the Royal Astronomical Society a paper 'On an improved method of using mercury in observations by reflexion,' in which he suggests the use of an amalgamated copper trough of special form for 'artificial horizons.' A considerable number of experiments leading up to the construction of the best form had been made, and are detailed with admirable clearness in twenty numbered paragraphs. Troughs of amalgamated copper, as suggested by Mr Pritchard in 1857, are now in use at the Royal Observatory, Greenwich; but they were not introduced until 1888, when the French officers who were co-operating in the determination of the Paris-Greenwich longitude pointed out their advantages.

A more important paper, which was in 1857 printed in the *Memoirs of the Society*, * represents a laborious piece of calculation undertaken in the interests rather of chronology

* Vol. xiii., p. 61.

† Mem. R.A.S., Vol. xxv.

than of astronomy. Its object was the correction of an error 'which appeared to be gradually increasing in prevalence and importance;' namely, a mistaken attempt to explain the Star of Bethlehem in terms of well-known astronomical phenomena. In a German work entitled *Handbuch der Mathematischen und Technischen Chronologie*, the celebrated *Dr Ideler* had discussed the theory that certain conjunctions of the planets Jupiter and Saturn fulfilled the conditions and phenomena recorded of this star. He had come to the conclusion that, of three conjunctions which occurred in the year B.C. 7, the first was of a nature sufficient to arouse the attention of the Magi and send them on their errand to Jerusalem, and that the last of the three conjunctions was so close that *to weak eyes the discs of the two planets might appear diffused into one;* and would satisfy, moreover, the condition of being in a proper position at sunset to conduct the Magi from Jerusalem to Bethlehem.

It remains to add that, though such conjunctions are of common occurrence, great importance was attached to them by astrologers; and this importance would be much enhanced if the conjunction were triple as above, or very close, the planets not being far north or south of one another. It is certain that a triple conjunction, with the further addition that one of the approaches was very close, would have caused the greatest excitement among astrologers at the time; and, if it could be shown to have taken place near the time of the Nativity, might be connected with the Star of the Magi not unreasonably. It at least appeared to Mr Pritchard 'very desirable that the astronomical part of the question should, if possible, be once for all set at rest;' and with this view he undertook the computations of the places of the planets for the year B.C. 7. He found that, so far as the fact of there having been three conjunctions during the year, Dr Ideler's statement was confirmed; but the dates assigned to the conjunctions by him were not correct; and still less was it true

that any such proximity occurred as to make it possible that the planets could, to any observer, have presented the appearance of a single star. The hope of settling the true date of the Nativity by this method must therefore be definitely abandoned. The result is a negative one, but thoroughly worthy of attainment, and eminently suited to Mr Pritchard's skill and sympathies.

Another research undertaken somewhat later, may be conveniently considered here, though slightly out of chronological order. For some years Pritchard worked hard at the theory of the object-glass, under the impression, which he ultimately found to be a mistaken one, that he could materially assist the practical optician by constructing elaborate tables of the proper curvatures for the surfaces. An achromatic object-glass is made up of two lenses, one of flint glass and the other of crown glass, each of which has two surfaces, which must be ground to definite shapes (depending on the particular kinds of glass selected for use) with the utmost nicety if the image is to be sharply defined and free from colour. How is this nicety to be attained? The conception of the difficulties formed by Pritchard (and by others both before and after him) was a numerical one. He thought that if the proper dimensions were once expressed in figures very accurately, the optician, who might otherwise have shirked the labour of obtaining these figures, would then be able to work to them, and produce a good result with certainty. He knew that, as a matter of fact, the method in use by the practical optician was to start with approximate figures only, and make the lenses in the rough, so to speak, correcting them afterwards by rules of thumb which were the outcome of practical experience; and he thought that this apparently rude process could and should be superseded by giving the optician accurate data to commence with. Many others have made the same mistake (for mistake it is, as Pritchard found after some years' work), and it is not easy to make clear the reasons

why it is so. In the first place, the above statement of the optician's method of work is in many ways unjust to him. The work of a sculptor might be described in the same way as a rough-and-ready process compared with that of accurately measuring all the dimensions of the model, and fashioning those of the statue to correspond. The work of the optician is, in fact, as has often been remarked, that of an artist, and must always remain so. A few figures are useful to him, as to the sculptor, but there is a point beyond which he cannot work by means of figures. A particular instance of the way in which figures cease to be useful to him may suffice. The theoretical conditions for an object-glass tell him that the radius of curvature of one of the surfaces should be 39.36 inches. He has in stock a grinding tool of radius 38 inches, but none nearer the required radius than this. Is he to be at the expense of making a new tool for this one particular surface? No; he knows that if the object-glass be made with this (theoretically) erroneous surface he can, by slight modifications in other surfaces, over which his art gives him command, produce as good a result as though he had been at the expense of a new tool.

This is only one out of several good sound practical reasons why figures cannot help the practical optician beyond a certain point. The subject is a most interesting one, and deserving of a fuller treatment than it has yet received in print, though more cannot be said here. I do not know whether even yet the mathematicians and the makers of object-glasses can be said to have arrived at a clear understanding of one another; and certainly the list of those mathematicians who have more or less failed to appreciate the methods of the practical optician includes many great names, such as those of Herschel and Airy.

CHAPTER III

OFFICIAL LIFE IN THE ROYAL ASTRONOMICAL SOCIETY

THE Astronomical Society came into existence on Wednesday,* January 12, 1820, and obtained the royal charter in 1831, when Sir James South was president. From the very first the movement was most successful. The meetings and proceedings quickly assumed a definite form, which for many years has remained substantially the same. Meetings are held on the second Friday of each of the months, November to June inclusive. At all these, excepting that of February, the chief business is the reading of papers on astronomical subjects, followed in most cases by a keen discussion of the points of interest raised. This keen discussion at the ordinary meetings is perhaps the most distinctive feature of the society.

The meeting in February is an annual general meeting, when the treasurer presents his yearly accounts, the secretaries read a report on the affairs of the society, and on the progress of astronomy during the year, and the gold medal of the society is presented to some distinguished astronomer for reasons which are expounded in an address by the president. In the early years medals (both gold and silver) were awarded more freely; but in 1831 it was decided that not more than one gold medal should be awarded in any one year, and sometimes there is no award.

It will be seen that the officers of such a society hold no sinecures. The preparations of the presidential address and

* The usual meeting day is now Friday, but apparently this inauspicious day was not that of the first meeting.

of the annual report on the progress of astronomy are pieces of work on which the greatest English astronomers have expended their labour and skill. The 'instructive eloquence, masterly arrangement, and comprehensiveness of view' which distinguished the presidential addresses of Sir John Herschel, have been extolled by Pritchard himself, who cites particularly the glowing and impressive speech delivered at the presentation of the medal to Francis Baily on the completion of what might well have seemed a dull and prosaic piece of work; viz.:—the society's catalogue of stars. And it would certainly be difficult to find a better illustration of the demands made upon a president on the occasion of the award of a gold medal, and of their successful satisfaction.

Demands of the same nature are, in a lesser degree, made upon the writers of the annual report, especially in those portions of it where tributes are paid to the memory of deceased Fellows. Other portions of the report involve considerable research, and a careful exercise of judgment in assigning the proper credit to workers in the same field whose claims are often to some extent conflicting. A paragraph of a few lines, which a reader of the report might suppose to be the work of a few minutes, may often represent hours of careful study and deliberation. And this is perhaps enough for our present purpose concerning the work of officers of the Royal Astronomical Society. It should however be added that the keen interest which at the ordinary meetings takes the form of frequent and animated discussion, and which is typified in the care bestowed on the president's address and the annual report, extends also to the meetings of council, and all else connected with the society. The attendance at the council meetings is always large, and it is by no means a rare occurrence for the whole council to assemble. A seat on the council is estimated highly, and there is often a brisk contest at election times.

Pritchard, who had been elected on the council in 1859,

was made a vice-president of the society in 1860, when Robert Main was president; and after being appointed secretary in 1862, was elected president in 1866. The years from 1862 to 1868, during which he was secretary and president, are thus those of Pritchard's most important work in the society.

The topics which were then engaging the attention of the society were not all suited for the discussion to which we have already called attention as forming the chief feature of the meetings. Thus the work of Adams on the secular acceleration of the moon's mean motion, splendid though it was, could not be discussed save by a few mathematicians. His work on the November meteors was more nearly related to a topic of popular interest. The great shower of 1866 had been watched by numerous observers, who all had something to say at the next meeting. The spectroscopic work of Huggins and Miller, again, was well suited for comment at a meeting, though such comments naturally took the form of inquiries at a time when spectroscopes were possessed by few. But as a topic for discussion, the solar surface was perhaps the favourite. The results obtained at the Total Solar Eclipse of 1860 were still fresh, and De la Rue, who obtained them, was the chief figure in the society. The Indian Eclipse of 1868 was being eagerly looked forward to as an opportunity of trying the photographic method under more favourable conditions. De la Rue meanwhile was working hard and successfully at the photography of the sun (as well as the moon); Carrington had completed (in 1863) his great work on solar spots; and a number of observers (Dawes, Howlett, Fletcher and others) were making a special study of the sun. We can thus readily understand that a question of fact as to the appearance of the solar surface aroused the greatest interest, and was discussed with some warmth at more than one meeting. The letters of Pritchard to Sir John Herschel faithfully reflect the spirit of the times,

for after a long silence following the letters on the eclipse of 1860 he renews the correspondence on the subject of 'willow-leaves.' The question of fact was as follows. The surface of the sun, when viewed through a telescope, does not appear uniformly bright, but mottled, or porous. Sir W. Herschel had noticed this in 1799. 'The whole disc,' he says, 'is strongly indented.' Again, 'The whole disc is very much marked with roughness like an orange. Some of the lowest parts of the inequalities are blackish.' 'The indentations are very uniform, but not round. It seems they admit of every possible shape.' (M. N., xxiv., p. 60.)

Now Nasmyth claimed to have made an important step in the explanation of this appearance. He declared that scattered over the surface were numerous solid bodies in shape like 'willow-leaves'; that these were uniform in size, but oriented in any direction indifferently, and that the interstices between them, through which the dark body of the sun showed, gave rise to the mottled appearance of the surface. Other observers, however, generally failed to recognise these willow-leaves, until the occasion to which we shall immediately refer. Some confirmation of a doubtful character was forthcoming. In the president's address on presenting the gold medal to De la Rue in February 1862, there occurs the following sentence :—

'More recently still, photographic pictures of the sun have been obtained by Mr De la Rue, not only exhibiting its well-known mottled appearance, but showing traces of Mr Nasmyth's "willow-leaves."'

There is evidence, however, that Mr Nasmyth's observation was not generally accepted. He himself attributed this lack of confirmation by others to the bad conditions, instrumental or atmospheric, under which they worked. 'In order to obtain a satisfactory view of these remarkable objects, it is not only requisite to employ a telescope of very considerable power and perfection of defining capability, but also to

make the observation at a time when the atmosphere is nearly quite tranquil and free from those vibrations which so frequently interpose most provoking interruptions to the efforts of the observer; without such conditions as I allude to, it is hopeless to catch even a glimpse of these remarkable and delicate details of the solar surface.' (M. N., xxiv., p. 66.)

At this point we may allow the letters of Pritchard to Sir John Herschel to take up the thread of the story. The first letter of 1863, October, was probably in reply to an inquiry by Sir John Herschel as to something which had already appeared either in a letter or in print.

'HURST HILL, FRESHWATER., I.W.,
'Oct. 19th, 1863.

'DEAR SIR JOHN,—The apparition of the "willow-leaves" was as follows :—

'Mr De la Rue was in my observatory at Clapham, looking through a telescope of Cooke's, aperture 6.7 in. ; he was expressing great admiration at its defining power when I proposed to him to put on a diagonal *solar* eye-piece, in which (after a suggestion of your own) the image from the object-glass is received on a piece of plate glass, and then viewed with the *full* aperture of the telescope by means of an exquisitely finished neutral tinted prism, over the Huyghenian eye-piece.

'De la Rue was expressing his astonishment at the definition of a spot, when all of a sudden he called out, "Here are Nasmyth's willow-leaves, sure enough." My turn to look came, and after a little teasing of focus I saw them myself, and I have seen them since; but, like Fraunhofer's lines, you must know what to look for.

'Of all men's eyes in a matter of telescopic vision, De la Rue's are peculiarly trustworthy.

'I attribute our seeing them—

'(1) To the *calm* way in which, with my eye-piece (constructed most successfully by Dollond for the eclipse), we were able to look at the sun persistently.

'(2) To the goodness of the object-glass and its size.

'(3) To De la Rue's practised eye.

'Under similar conditions I believe these strange entities are at all times visible.

'*Apropos* of the "solar eye-piece,"—will it be well for you to claim this successful form of eye-piece?—*you* suggested it in your Cape book, but it is claimed both by Dawes and my colleague Hodgson. If you have never seen the sun with this contrivance, you can have no conception of the effect; indeed, you cannot be said to have seen the sun at all. I speak, of course, comparatively. I have written to De la Rue to save time if you have not already written to him; and if you have, no harm's done.—Yours most truly,

'C. PRITCHARD.'

'HURST HILL, FRESHWATER, I. W.

'Dec. 15th, 1863.

'DEAR SIR JOHN,—

'We had a strong debate on "willow-leaves" last Friday evening. Mr Dawes will have it that he sees nothing but a "flocculent precipitate." Our "willow-leaves" are a sort of "crystalline precipitate." I urged that the question is after all little better than one of words. Any precipitate would furnish solid particles for *illuminating* power.

'Hoffman was with us, and agreeing as he did fully in the question of the non-luminosity of such gases as hydrogen and hyd. + ox., he did not know what to do with the blue flame of cyanogen.

'I forgot to instance arsenic in arseniuretted hydrogen deposited on cold porcelain in Marsh's test. Did you ever see this beautiful action?

'In the case of burning cyanogen, no carbon is deposited on paper. So you see the direction which this question takes. Can you see aught of the way out ?

'Our friend the Astronomer-Royal argued in opposition to my argument which involved the necessity of some *solid* form of incandescent matter. "Why, don't you see the gaslight before you!" Of course, he was *nowhere*.—Believe me, yours very sincerely,

C. PRITCHARD.

'Did you read my obituary last year of the American astronomer? If not, you will be *amused*.

'We give Bond—the medal.'

'FRESHWATER,

'Jan. 16th, 1864.

'DEAR SIR JOHN,—You will be pleased to hear that Mr Stone at Greenwich applied the "Herschelian contrivance" to the large refractor at Greenwich, and there saw *at once* what puzzled him. The sun covered with what? . . . ? . . . ? . . . with, as it were, RICE (rice)! He thought from pictures that Nasmyth's willow-leaves were dark, and rest of sun bright! But lo! the converse—he saw *bright rice*, and plenty of it. How strong a confirmation and how independent and beyond question, and how much more graphic a description of the phenomenon than willow-leaves. Henceforth — the rice stratum, or rather strata.—Truly yours, believe me,

'C. PRITCHARD.'

We gather then that in this controversy, which occupied the attention of the Royal Astronomical Society for some time, Pritchard was on the side of Nasmyth, and believed in the 'willow-leaves,' or 'rice' or other structure symbolising the appearance of the sun's surface. There seems to have been considerable diversity of opinion among Nasmyth's adherents as to the best symbol for the objects actually seen. Nasmyth himself was not at all sure that willow-leaves was

the best term. On a visit to Rome in 1865 he (Nasmyth) had 'the pleasure to pay his respects to Father Secchi, in company with Otto Struve. On our entering the observatory we found him at work on a model representation of the solar photosphere, which consisted of a blackboard thickly scattered over with *oat grains*! Father Secchi at once remarked, "That is what *I see* as to the structure of the sun's surface."'* Nasmyth goes on to say that he leaves it to others to settle the question of name for these objects. Pritchard apparently much preferred the term 'rice' to 'willow-leaves;' but was none the less an ardent supporter of Nasmyth. The 'strong debate' referred to in the letter of December 15, 1863, was opened by a paper from Dawes† on the 'Telescopic appearance of the envelopes of the sun and its spots,' in which the author declared that though in the vicinity of spots which are rapidly expanding or closing the appearance of the surface at the margin resembles small bits of straw or thatching interlacing in all directions, still he had not been able to verify the 'willow-leaves' of Mr Nasmyth. Mr Huggins followed on the same side, as also Mr Howlett. Dr De la Rue and Mr Pritchard were strong advocates for Nasmyth. We may perhaps reproduce the words of the latter as given in the *Astronomical Register*, (Vol. II., p. 5).

Mr Pritchard observed that Sir John Herschel had written to Mr De la Rue and himself on the subject, and described the appearance as a 'slow precipitation of flocculent matter.' 'The sun,' continued Mr Pritchard, 'is covered with small objects—bits of straw, flocculent matter, or what you like—exceedingly brilliant and different from the other parts of the surface : and this not only in the neighbourhood of the spots. It matters not what you call them—there

* *Astronomical Register*, iii., p. 223.

† Mr Dawes was apparently not present at the meeting, probably from ill-health. The paper was read by the secretary, Mr Hodgson.

they are; and Sir John Herschel's description is perhaps better than Mr Nasmyth's. The "willow-leaves" were wanted. An incandescent liquid or gas, such as we suppose the sun's atmosphere to consist of, will not give out light: we therefore wanted something in it, or where could the light come from? The advancing state of our philosophy required the "willow-leaves," and they came just in the nick of time.'

It is to be feared that these remarks are now out of date. The 'advance of our philosophy' has completely swamped them, and many who read them will marvel that only thirty years ago it was stated as commonly accepted that 'an incandescent liquid or gas will not give out light.' With the disappearance of this theoretical reason for the existence of the 'willow-leaves' they themselves have been shelved, and it is only by recalling this forgotten *raison d'être* that we can realise the importance of the discussion. The conflict was renewed at many subsequent meetings, and carried on in the press. At the next meeting of the society Mr Nasmyth replied to Mr Dawes, and the subject occupied nearly the whole evening. Pritchard was not present. At the March meeting Mr Stone and Mr Dunkin, of the Royal Observatory, Greenwich, suggested the term 'rice grains.' 'A handful of common rice, let fall gently, would very well represent what was seen.' But Mr Pritchard said that, 'in justice to the man who, years ago, saw them for the first time and got no one to second him, it would not be well to alter the name of the "willow-leaves." ' At the April meeting Mr Dawes replied again unconvinced, and so the controversy went on for some years. Pritchard took a considerable share in it. We see from the letters to Sir John Herschel that it originated in observations by De la Rue at his telescope, and he was throughout a staunch adherent of Nasmyth. Want of space compels me to omit several more letters written in 1866, when the controversy had lasted three years, but was apparently still in full blast. They illustrate the fact that Prit-

chard acted as a sort of centre, drawing the fire of all the combatants; and it is important to remember this side of his character.

One further point may be noticed in connection with the letters to Sir John Herschel on 'willow-leaves.' Pritchard was convinced that their confirmation by De la Rue and himself was due to the use of a diagonal (plain glass) solar eye-piece, and was anxious that the credit of first suggesting this form of eye-piece should be secured to Sir John Herschel, who had first suggested it in his *Cape Observations*. There are several letters extant, which need not however be here reproduced, showing that Pritchard took considerable trouble to this end: and these two small enterprises for securing the recognition of Nasmyth's discovery of the 'willow-leaves,' and of Sir John Herschel's invention of the diagonal solar eye-piece, are apparently characteristic illustrations of his work about this period. They are such as often fall to the officers of scientific societies; and in zealously prosecuting such enterprises, Pritchard was fulfilling admirably one important part of his functions as secretary of the Royal Astronomical Society.

For another important function of a secretary (though one rather difficult of definition) Pritchard was well fitted. He stimulated work and enterprise in others. When he became, later in life, the director of an observatory, this faculty was especially characteristic of him, and of the greatest value; and I was delighted to come across the following direct testimony to the same power of stimulation during his official life in London. Mr Dawes suffered from very bad health, and to him the exertion necessary for publishing observations was specially distasteful. Those who have had experience of publishing their observations will know too well what it must have cost him to prepare for press the three hundred and seventy quarto pages of double star measures which appear in Volume xxxv. of the R.A.S.

memoirs. This is the work to which he refers in the following letter :—

‘HOPEFIELD, HADDENHAM, THAME,
‘18th December 1867.

‘MY DEAR MR PRITCHARD,—Many thanks to you for your hearty congratulations on the completion of my large work. And I assure you I feel that you also may most justly be congratulated on the success of your encouragements and kind stimulations to the needful exertion ; and I beg you to accept my warmest thanks for the interest you took in pressing me forward to the requisite “sticking point,” without which, I candidly acknowledge that it might very likely have crept on so deliberately as scarcely to have reached the “Finis’ while I was at all capable of completing it. The possibility and the prospect of its appearing in the same volume, or at least about the same time, as Sir John Herschel’s, was one of the chief stimulants to the necessary exertion. . . .—Yours faithfully,

‘W. R. DAWES.’

In his purely business duties, Pritchard was active and efficient, as is illustrated in the next letter to Sir John Herschel (omitting a few which deal with the claim to the solar eye-piece above mentioned, and in which the conduct of a rival claimant is discussed with more warmth than admiration).

‘HURST HILL, FRESHWATER, I.W.,
‘Jan. 24th, 1864.

‘DEAR SIR JOHN,—May I ask if you remember a “Beaufoy” clock which you once borrowed from the R.A. Society so far as to tell me anything of its features, appearance, or maker’s name?

‘The council have been at issue about this clock now for twenty years with the Royal Society.

‘We lent it to them for Sir J. Ross and the Antarctic

Survey, and till ten days ago could get no intelligence thereof until I got on its trail by perseverance.

‘We believe it is in cases (never yet unpacked) at General Sabine’s office at Woolwich—so he (the General) thinks; but he would be glad of marks of identification, and we fear you are the only living person who has looked upon its face.

‘Will you present my best regards and respects to Lady Herschel and your circle.—Ever sincerely,

C. PRITCHARD.

‘P.S.—I am, as in duty bound, drawing up the progress of astronomy during the past year for the Annual Report R.A.S. Would it be a trouble or inconvenience for you to cast your eye over it when complete, and just pencil any hint? This, of course, would be private, and without the slightest responsibility. I know what your hints are worth, and I distrust my own powers. Pray say “Nay” if you feel any hesitation.’

Some of the letters to the assistant secretary of the R.A.S. tell us more about the hunt for this missing Beaufoy clock. Here is one of them:—

‘FRESHWATER,
‘1864, January 4th.

‘DEAR SIR,—I am endeavouring that you should be permitted (on some day to be appointed by General Sabine) to proceed to Woolwich, there to inspect certain cases which the Pres. Roy. Soc. has in his office. These cases were landed from the ships employed in the Antarctic Survey, and were said to contain clocks and pendulums which were proposed to be used by Sir James Ross in verification of certain observations he had made with them near the South Pole. These experiments were *never made*. The cases are at Woolwich now in General Sabine’s office, and you will there probably find the truant instruments.—
Yours, etc.,

C. PRITCHARD.’

A hunt like that for the Beaufoy clock often entails considerable correspondence and trouble, and this may be taken as one instance out of many. By the irony of Fate it fell to the present writer, in his capacity as secretary to the same society, to indite a very similar letter to Professor Pritchard in 1892 concerning an instrument borrowed by him from the society some quarter of a century before. No immediate news of the instrument was forthcoming, but it was ultimately discovered at the instrument maker's, having been left there unclaimed for about ten years. How the Pritchard of 1862 would have delighted in bringing to book the Pritchard of 1892! Few matters escaped the vigilance of the former younger gentleman (then only about fifty-four years old), not even the treasurer's accounts. It might have been thought that, with his duties as secretary, liberally as he interpreted them, he would have had enough to occupy him without concerning himself as to the manner in which those of other officials were discharged. But it occurred to him that since the treasurer's accounts were printed in the Annual Report of the council, and since he, as secretary, was responsible ultimately for the whole of this report, he ought to examine these accounts; and he accordingly found a small discrepancy of £111. 3s. 6d. between the printed and audited accounts. This naturally made a little trouble. The poor assistant secretary, who had of course done all the work on systematic lines, could not understand whether he was being accused of dishonesty or merely of incapacity. The discrepancy was ultimately traced to a fault in the method of reproducing arrears of subscription, and it was shown that there had been no real error in fact, only in appearance. We of the present day undoubtedly owe to Pritchard the establishment of a proper method of keeping and stating the accounts; but those concerned at the moment do not seem to have enjoyed the experience of having it established.

It must not, however, be supposed that there was any permanent friction between Pritchard and the assistant secretary. On the contrary, they were on the best of terms, as the correspondence of the assistant secretary (all most carefully preserved, and lately arranged and stored by Mr Wesley, his successor) most clearly shows.

Perhaps Pritchard's best work as secretary was shown in the preparation of the *éloges*, as he preferred to call them, on distinguished Fellows and Associates of the society. He was painstaking in collecting the facts, and his style was clear and vigorous. The same good work was manifested from the presidential chair in the preparation of the addresses to gold medallists. Pritchard wrote the *éloges* of Wilhelm Struve, Sir W. Rowan Hamilton, Admiral Smyth, and others ; some years later, of Sir John Herschel. The *éloge* on Wilhelm Struve was reproduced at length in the *Astronomical Register* for April 1865, which may be taken as evidence of its importance and interest. He took a great deal of trouble in drawing up the Annual Report generally. To him we apparently owe the practice of dividing the *Notes on the Progress of Astronomy during the Year* into separate paragraphs with headlines. This division appears first in 1865.

The average reader will no doubt skim lightly over this rather dry catalogue of secretarial duties : there may, however, be some Fellows of the Society for whom it will call up a picture of the times. In looking over the old records I have found them speak so eloquently for themselves that I should have liked to reproduce them here with as little comment as possible, in the hope that others might find them similarly effective in recalling the events and surroundings of a period only thirty years past. and yet so different from our own. In this hope I here add a few extracts from the reports of the meetings of the society, as given in the *Astronomical Register*. The extracts have not been made at random, but are still tolerably representative. I have

naturally endeavoured to select discussions in which Pritchard took some share, and which referred to matters occupying a prominent place in his later life.

The first gives us a notion of the expectations beginning to be formed of photography. Some are sanguine of its success as a new power, others sceptical; Pritchard does not commit himself.

ROYAL ASTRONOMICAL SOCIETY MEETING, 10TH JUNE 1864.

(The subject of the discussion is the Orion Nebula.)

Mr Stone said that the nebula had been carefully observed at the suggestion of M. Otto Struve, who thought there was evidence of change in its form; and Mr Carpenter, having been entrusted with the observations, had appealed to him, and he considered Mr C. correct in thinking the squareness of outline in Prof. Bond's drawing exaggerated, and that Sir J. Herschel's represented the object better, thus tending to show that the nebula remained as when seen by Sir J. H. at the Cape. The importance of the subject justified drawing attention to it, and he hoped other observers would take the next opportunity of comparing the drawings with the object.

Mr Pritchard: Are you speaking of drawings or engravings? because, if the latter, we find it impossible to get engravers to do justice to drawings. Allowing for this difficulty of engraving, it is probable Professor Bond's representative is very right.

Mr Hodgson: We have got the American and the English drawings; but I should like to see with them the Russian drawing and exhaustive paper of Liapunow.

Mr Stone: It should not be overlooked that, with regard to change in the nebula, our strong feeling of the accuracy of Herschel's drawing indicates no change. As to the Russian drawing, Dr Winnecke, who is here, can perhaps tell us something.

Dr Winnecke: In the drawing referred to, the stars are

laid down with extreme accuracy ; but I don't think it can be relied on for exact detail of light and shade.

Mr Lockyer remarked that the Rev. Mr Webb, who had looked much at the nebula last winter, agreed with Messrs Stone and Carpenter.

Mr Pritchard again adverted to the difficulty of engraving drawings of such objects.

Mr Vignoles : Photograph them.

Mr Hodgson : It won't do.

Mr Vignoles : It will. Excuse me, but I am in the habit of having maps and drawings constantly photographed with the best result, and the Government do so extensively, reducing plans most perfectly.

Mr Hodgson : I suppose engineers say photographs are sufficient for all practical purposes.

Mr Vignoles : Absolute correctness is required, and is obtained.

Mr Hodgson : The difficulty is in the shading.

Mr Beck : Photographs can be taken so perfectly from pencil drawings as not to be distinguished from the original.

Mr Hodgson : Will you reproduce a drawing of a nebula we have received from Mr Lassell, and which we are afraid cannot be done justice to?

Mr Beck : I have no doubt I can, but must see it first.

Mr Pritchard : Will any patriotic member do this ; that is, reproduce Mr Lassell's drawing like the original ? If so, we will gladly pay him ; or he may do it without if he likes. Mr Lassell, in his zeal for the cause of astronomy, has built a magnificent telescope, has expatriated himself, as it were, and we are bound to carry out his wish of reproducing his drawings properly, if possible.

Mr Vignoles : *Two to one on Mr Beck !*

As regards the following extract, it need only be remarked that the last piece of work completed by Professor Pritchard,

for which he received a Royal Medal in 1892, was a series of determinations of stellar parallaxes by the photographic method.

R. A. S., JANUARY 9TH, 1863.

A letter was read from Herr Auwers, of Gotha, on the Parallax of Stars, the result of researches carried out at Königsberg. Mr Pritchard asked if the Astronomer-Royal would kindly give the meaning of the letter in plain words. The Astronomer-Royal said the meaning was this—that Bessel found the parallax of 61 Cygni to be

$0''.366$, with a probable error of $0''.012$;

while Struve, with whom Auwers very nearly agreed, found it to be

$0''.5107$, with a probable error of $0''.0282$.

Mr Pritchard asked what was the Astronomer-Royal's own opinion as to these probable errors.

Mr Airy: I say those probabilities are not worth a pin.

Mr Pritchard: Does it not throw a considerable doubt on the whole subject of parallax?

The Astronomer-Royal replied that to some degree it certainly did.

Finally we have an occasion on which Pritchard occupied not the secretarial, but the presidential chair. It should be remarked that there are no meetings of the society in the months June to October.

ROYAL ASTRONOMICAL SOCIETY. First Meeting,
November 9th, 1866.

The Rev. C. Pritchard, M.A., F.R.S., *President*, in the chair.

Secretaries—Mr Stone and Mr Hodgson.

In expressing the pleasure he felt in meeting the members of the society after the recess, the president said it was coupled with a regret that no great astronomical progress was to be reported. No discovery of importance had been made

since the last meeting ; but astronomy was an accumulative science, and much valuable matter had doubtless been treasured up, to become available for future use.

But at any rate he might say that something had been done by astronomy—something of great importance. Astronomy had, in fact, recovered the Atlantic cable! An illimitable ocean with an almost invisible thread at the bottom of it, at a depth of two miles—what a fine problem it was to find it! A reward of £30,000 was once given for a chronometer for finding the longitude: this, however, would not have discovered the cable, although it was the longitude which was really wanted. The longitude was, in fact, obtained exactly; and how was it done? Not by any chronometer, but by a system of signals sent direct from Greenwich! And therefore it was due to astronomy, and to the strong faith of men, that the cable was picked up.

The president also wished to call the attention of the members to the expected great shower of meteors on the 13th or 14th of the month. If any man went to bed on either of those nights, he was not worthy to be called an astronomer; he therefore appealed to his *confrères* not to go to bed on this particular occasion. After a few remarks as to the extraordinary variable T. Coronæ, and the correspondence and observations regarding it, the president concluded by alluding to what had been done for the comfort of the members during the recess. There is such a thing as physical comfort—no one could go on observing night after night in a state of discomfort. Sir John Herschel, in his *Cape Observations*, found the greatest difficulty in keeping himself warm, and at last he had resort to a *kitten*. (Laughter.) Now our difficulty has been, not to keep ourselves warm, but to keep ourselves cool; an attempt has, however, been made to ventilate the room, with what success remains to be seen. The president added

that Mr Williams had succeeded in providing a complete printed catalogue of the society's library, which any gentleman might have at a charge of 2s. 6d.

With this brief but characteristic address of Mr Pritchard from the presidential chair, we might well close this chapter of his life in relation to the society; but to prevent misconception it must first be emphatically remarked that his activity and interest in the affairs of the society did not cease when he had passed the chair. He remained on the council till 1876, several times being a vice-president, and was re-elected to it in 1883; but in 1887 he permanently retired, feeling the necessary journeys from Oxford too great a tax on his advancing years. His interest in the affairs of the society was, however, not even then lessened in any degree, and only a few months before his death he took a prominent part by the issue of circulars in one of the elections of officers.

Of Pritchard's undertakings subsequent to his official life, but connected with the society, may be specially mentioned his *éloge* on Sir John Herschel, his editing of the Double Star Catalogue of Sir John Herschel (in collaboration with the Radcliffe observer, Rev. Robert Main), and his circular proposing a memorial to Sir William (and Caroline) Herschel at St Lawrence Church, Upton, Slough. All these illustrate Pritchard's great reverence for the work of the Herschels, which appears in other ways in these pages. The Catalogue of Double Stars forms Volume xl. of the *Memoirs of the Royal Astronomical Society*, and was published in 1874. It was the result of an undertaking by Sir John Herschel, to which the following two letters refer.

'FRESHWATER,
'April 17th, 1866.

DEAR SIR JOHN HERSCHEL,—The question of the

catalogue of your father's double stars was brought before the council of the R. Ast. Soc. on Friday last.

'The unanimous feeling of the council was that nothing on their part ought to be wanting which could conduce to the completion of the catalogue for publication in the memoirs of the society. At the same time it was felt that the catalogue itself is now in a condition which requires only the direction of a mind towards a considerable amount of mechanical work—this latter we at once know *you* ought not to undertake, hence it was resolved and unanimously carried that—

“A sum not exceeding fifty pounds be placed at the disposal of Sir John Herschel towards defraying the expense of preparing the catalogue of Sir William Herschel's double stars for publication in the transactions of the R. Ast. Soc.”

'Of course no restriction whatever is implied in your choice of a computer, but I am not wrong in stating that if Mr Alex. Herschel has the leisure and the inclination to undertake the hard work, we have an idea that it would be more ably and satisfactorily done, both to yourself and to those who hereafter will refer to the catalogue, than by a stranger having nothing beyond a pecuniary interest in the work.—I am, my dear Sir John, very sincerely yours,

'C. PRITCHARD.'

P.S.—Airy has distinctly seen the willow-leaves—the assistants always see them in the large Greenwich equatorial, when the definition is really fine: power 120 about.

'COLLINGWOOD,

'*April 23, '66.*

'MY DEAR SIR,—My best thanks are due to yourself and the council of the Astronomical Society for the assistance you and they have been so good as to accord me towards making out the catalogue of my father's double stars in as

complete a form as the recorded observations will permit, and for the kind consideration which prompted the wish to alleviate to myself as far as possible the more laborious and mechanical part of the work. The sum named is, I suppose, more than amply sufficient for the purpose. As soon as my son Alexander returns, I shall set him to work at it. What I propose is a catalogue of double entry—*i.e.*, an index catalogue by classes and numbers, and a working catalogue in order of R.A. brought up to a prospective date. These *two* will give room in their columns for all the recorded particulars or their mean result. The identifications of the non-identified stars will, however, be the chief difficulty, and I have some notion of rigging up my old clumsy equatorial stand as an out-door stand, and mounting my 5-inch Tulley's object-glass and finder, and setting Alexander to work to look them up by the descriptions given of their places, *nous verrons*. It may be a good while about, but if it is not done under my own immediate eye, I could not trust it to anyone else, for it will need constant reference to myself.—Believe me, my dear sir, yours very faithfully,

‘J. F. W. HERSCHEL.’

Sir John did not, however, live to complete the work. The catalogue published by Main and Pritchard corresponds to the working catalogue, the second of the two proposed by him. But the editors also carefully arranged his synoptical tables of measures in MS. and indexed them. It may be said that they carried out the wishes above expressed in the best way possible under the circumstances. In a review of the catalogue by Otto Struve which appeared in the *Vierteljahrschrift der Astron. Gesellschaft* for 1876, it is observed that—

‘The Royal Astronomical Society has, by the publication of the above catalogue, fulfilled an act of piety towards its deceased illustrious Fellow, Sir John Herschel.’

Before passing, in the next chapter, to Professor Pritchard's

life at Oxford, several letters of interest relating to the period of his life we have just been recalling may be here put on record with the briefest of comments. They practically tell their own story.

‘ November 17th, 1866.

‘ DEAR SIR JOHN,—Thanks for the meteor paper—for our M.N. My own eye was steadily fixed with few interruptions on the Sickle, and from the Sickle to Orion. I had made the same note as you on the radiant point, and yesterday I wrote to a friend to that effect. The radiant point beyond all doubt was well *within* the hook, and I had in my chart, the day before yesterday, put the radiant for Nov. 13th close to the star X! How curious!

‘ The battery of meteors was so overwhelming that I confined my attention to counting meteors which pelted Orion, keeping an eye also on the Sickle. The rise to a maximum and the fall from it was singularly uniform.

‘ I observed the apparition of the new meteor stars without trains in the hook of the Sickle. I saw one persistent cloud for several minutes, but I observed no rotation, but only a wafting onwards to the south. *Ex pede leonem*. I read the long article in the *Times*.

‘ I hope Aleck saw all at Glasgow, but ’tis a nebulous place.
—Yours, dear Sir John, very truly,

‘ C. PRITCHARD.’

‘ March 27th, 1867.

‘ MY DEAR SIR JOHN,—A correspondence with Mr Dawes on certain astronomical “priorities”—disagreeable, but I fear not always evitable subjects—has put a certain thought into my head, which I venture to put out of it into yours—if it has not been there before.

‘ Did you not at one time think of editing your father’s papers in the *Phil. Trans.*? The labour may be too much

for you to undertake unaided, but will you pardon me for suggesting (it may be ignorantly and officiously, and if so, forgive it for the motive's sake) that—*Is it possible for Aleck to do it?* With a few hints from you in the way of reference to the additions or corrections of modern times, he, I imagine, could complete the matter sufficiently well.

'These papers are not very accessible even to me. I cannot help thinking the task might be a very grateful one to the grandson, and it might assist in putting him into the scientific position which he may justly claim.

'We are *binding* up your star allineations, so that nothing may be lost. Your star catalogue is in the printer's hands.

'What brought up the thought of Aleck to my mind is the probability that your father did see and describe the 'rice grains,' 'granulations' or 'willow-leaves;' but not having by me the proper original, I am all at sea.

'In *Good Words* of next April I give some account of Fraunhofer's Lines and T. Coronæ,* and at last just venture on the speculation that it may be an old worn-out sun waxed dim—Faye says with a crust on it; and then a planet and a satellite went crash or scrape into it. If so, the ocean of the planet *might* afford the hydrogen and the *blue* that (as when the wind blows over gas), and the crash of the satellite (oceanless) *might* have caused the second outburst! (*Valeat quantum.*)

'Hoping this may find you in health and happiness—including in *you* all your circle—believe me dear Sir John, sincerely yours,

C. PRITCHARD.'

'FRESHWATER,
'March 11th, 1869.

'MY DEAR SIR JOHN,—I have recently had one of the greatest intellectual treats I remember to have ever enjoyed. I found a parcel of your great father's memoirs

* The 'New Star' of 1866.

in the library of the R. Astr. Soc. I have arranged them—read many, and glanced at the contents of all. I find there are seventy in all, but M. Struve in *Etudes Stellaires* speaks of *seventy-three*. Before I take any steps to collate them with the R. S. Transactions, I hope you will excuse my asking you whether you have any separate copies of any of these memoirs which you would feel disposed to let us have in order to complete the set before I proceed to get these very precious papers properly bound. If you have any such by you, I will send you the list of the three or four missing ones. I have seen none on the *first discovery* of the Georgium Sidus. The first is 1780, on α Ceti (Mira) and on Lunar Mountains. The last is June 11th, 1818, on the relative distance.

‘I am amazed at the grasp of mind and the unwearied industry exhibited in these great memoirs—always with a purpose and going straight to it. I am almost as much surprised that they are so comparatively little known among astronomers, and have not as yet been collected *so far as I know*. I consulted them on the subject of the structure of the universe for a paper I am preparing for *Good Words*, and that led to my examination of the whole—so far as we have them.

‘This leads me to a question which puzzles me considerably, and which I venture to ask you, if I am not unreasonably bold.

‘Whereabouts have we ground for supposing are the nebulae and clusters which abound towards the pole of the Milky Way; are they *outside* of our strata? You say that the telescope does in places *pierce through* our strata. Is this probably the case of the nebulae or of any or most nebulae? I hope I am not putting a very ignorant question, but I feel bewildered. Sir W. H. seems to have changed his views after years of patient observation—if so it does not appear that we know the exact form of the boundaries of the galaxy, but it seems conceivable that it has been pierced in its thinnest section.’

CHAPTER IV

LIFE AT OXFORD

ON Thursday, February 10, 1870, the Rev. Charles Pritchard, M.A., F.R.S., F.R.A.S., late President of the Royal Astronomical Society, and formerly Fellow of St John's College Cambridge, was elected to the vacant Savilian Chair of Astronomy in the University of Oxford.

It was remarked in the Introductory chapter that his appointment was due to the knowledge rather of what man he was than of what things he had done. His concrete undertakings had indeed been hitherto singularly unproductive. He had suggested a new form of mercury trough, but it was not adopted on his suggestion; he had made a long calculation on planetary conjunctions in order to disprove a point in theological chronology—a purely negative result; he had observed the eclipse in Spain with success, but his observations were quite overshadowed by De la Rue's, and were not even mentioned in print; and he had undertaken a heavy piece of optical work on lines which he found after its completion to lead to no useful result. Carefully studied, the record is one which shows clearly the ability, enterprise and versatility of the man; but to a casual glance there is very little to catch the eye. His painstaking work for the Royal Astronomical Society, and the trouble he took in settling questions of controversy (in which a man of his varied accomplishments could venture to take a prominent part, although not a principal in the dispute), were not the least important part of his work

up to the time of his election as Savilian Professor. Such work, though not known to the general public, could not fail to be appreciated by the astronomers, especially the Fellows of the society. And it is creditable alike to the society and to its ex-president that it was the influence of several prominent Fellows which secured Pritchard his appointment. Without such an organisation a man like Pritchard might have been lost to astronomy; by its help he was placed in a position to do full justice to his great powers—powers of which he had perhaps failed to give evidence, save in ways of which the society alone could take note.

As above remarked, Pritchard was elected Savilian Professor of Astronomy in February 1870. In the *University Gazette* for April 26 he announced a series of popular lectures on 'Modern Astronomical Discoveries,' the first of which, given on Tuesday, May 10, at noon, was his Inaugural Lecture. And without following the detailed announcements further it may be generally remarked that the Professor's work soon resolved itself into two parts—the delivery of lectures on Mathematical Astronomy (Newton's *Principia*, Lunar and Planetary Theories, with the purely mathematical parts of spherical astronomy), and the instruction in practical astronomy. The mathematical lectures were suited to the requirements of those reading for the final mathematical schools, and were continued on much the same lines so long as Professor Pritchard was able to take an active share in the teaching work. They need not further concern us here.

It is with the development of practical astronomical work in the University, with the establishment, rapid development and great success of the University observatory, that Professor Pritchard's name is inseparably connected: and to this piece of history I must now endeavour to do what justice I can.

There was a small observatory under the control of the Savilian Professor when Pritchard was elected, which he describes as 'a small but sufficient building, containing what

had once been a good five-feet transit, a clock, and a small altazimuth. The two former had been provided mainly at the expense of his predecessor.' Pritchard began to make use of these instruments for practical instruction in 1871, and before this he had, at his own expense, repaired the instruments and building. In 1872 he provided an assistant, who attended every evening for three hours, so that the small observatory might be at all times accessible to students, even when the Professor was unable to be there.

But the inadequacy of this equipment was soon realised. One most important defect was the absence of an equatorial of any kind, and though the Professor tried to mount one of his own, he found the building quite unsuitable. His thoughts naturally turning to the possibilities of better instruments and a better building, he determined to ask the University for a large refracting telescope. He proposed 'that the University should be asked to provide a refracting telescope of $12\frac{1}{4}$ inches aperture, equatorially mounted, and furnished with all the accessories required for the prosecution of modern astronomical research. Such an instrument would rank among the best of modern telescopes, and be worthy of Oxford.

'The cost of this telescope and of the building to contain it would not exceed the sum of £2500. It could be in a workable condition before the end of 1873.'

This application was made through the museum delegates, and brought before Convocation on March 4, 1873, when it was carried *nemine contradicente*.

It will be clear from the estimate of time and expense given above that Pritchard had already made preliminary inquiries before making his proposal. He had in fact been in correspondence with Mr (now Sir Howard) Grubb, of Dublin, and learnt that he had materials for a $12\frac{1}{4}$ -inch object-glass already in hand. The earliest letter of Mr Grubb preserved in the observatory records is dated December 5, 1872, and opens :—

'I have been considering the matter of the 12-inch equatorial, and have decided that, having the materials for the objective on hand, I could supply you with the equatorial complete for £1200, delivered at my works.'

After the money was voted in Convocation, a formal contract was drawn up, and the terms definitely settled by the end of May 1873. Apparently the hopes of having the equatorial erected by the end of 1873 were not based on anything Mr Grubb had said, and he could not undertake to make the object-glass in so short a time; but he promised to do his best for speed, and by March 4, 1874, was able to report that 'the equatorial was erected, the object-glass attached, clock-driving apparatus complete, and all in fact ready for trial.' It was at first hoped that Professor Pritchard would go over to Dublin to try it himself, but ultimately he asked Dr Brünnow to do this, and a very favourable report was received from him on March 25, and soon after this the instrument was ready for delivery at Oxford.

Meanwhile the building to receive the instrument had been designed by Mr Charles Barry; a site had been chosen for it in the parks, and building operations had been commenced.

But a modification of fundamental importance had been made in the whole scheme. Dr Warren De la Rue (on whom the University had conferred the honorary degree of D.C.L.* in recognition of his astronomical work) had

* The year 1870 was that of Lord Salisbury's installation as Chancellor of the University in succession to Lord Derby, and a large number of honorary degrees were conferred. In the list we find the names of J. P. Gassiot, the Earl of Rosse, Warren De la Rue, William Huggins. The following letter to Dr Huggins refers to the ceremony:—

'OXFORD, 9 KEBLE TERRACE,
'JUNE 19, 1870.

'MY DEAR MR HUGGINS,—I will see about an abbreviated robe for you—you will find it at Standen, a tailor in High Street—but what is as necessary is a cap. If you have none of your own from your recent Cambridge use, I think you had better send the exact measure of your hat in its two horizontal axes and its inner circumference to the above Standen to-morrow by telegram. Else you may

offered to present his splendid instruments to the University, and his offer had been accepted.

This valuable gift necessarily made a great change in the plans for the building. Mr Barry was consulted as to the housing of the new instruments, and arranged for additional buildings to be attached to that already designed for the refractor. But it was clear that the whole would now be a well-equipped observatory. Originally it had been contemplated to leave the transit where it was, in the small observatory near the museum, separate from the new refractor. But it was now obviously the best course to do away with this small observatory and collect all the instruments in one place. The result was the present fine observatory in the parks, just as it stands, with the exception of the large lecture room, which was added in 1877.

It was not, however, the plans for building alone which were altered by Dr De la Rue's gift. An even more important change was introduced into the aims and objects of the general scheme. Professor Pritchard had originally asked for an educational instrument—a telescope 'suitable for the instruction of his class,'* albeit 'furnished with all the accessories required for the prosecution of modern astronomical research.†

get into some inconvenience, seeing there are 50 D.C.L.s, and you won't like a greasy old cap. Both Gassiot and De la Rue have been down here to settle their robes. I will tell Standen you *may* telegraph to him for this cap, as a contingency. His shop is next door to St Mary's.

'A great error has been made by omitting Lassell, but Main and I will see about D.C.L. for him before a year is out. Of course you have notice about the special train for all you D.C.L.s on Tuesday morning. If you find you have no other engagement, you will, I hope, dine with me at my college hall (New Coll.) on Wednesday, with a heap of others.

'Thanks for Hofman's address.—Believe me, yours very sincerely,

'C. PRITCHARD.'

Pritchard was thus able, in his first year of office, to take some share in honouring his friends.

* *Univ. Gazette*, February 11, 1873.

† *Ib.*, etc.

He did, indeed, promise to 'make it his endeavour to lay in Oxford the foundation of a school of astronomical physics,'* but the 'educational point of view' was kept prominently forward.

But with the accession of the instruments which had done such good and historic work in photography, the possibility of an observatory for research in astronomical physics became a reality, and henceforth the observatory was 'the new Savilian Observatory for Astronomical Physics at Oxford.' Under this title Professor Pritchard describes it in the 'Monthly Notices' for December 1873; and in a letter to the *Times* (January 3, 1874) he announces that 'the University has led the van in England for the first foundation of an observatory for astronomical physics.†' In thus insisting on a change in the character of the institution, Pritchard was in no way breaking faith with the University. This change was clearly put before the committee on the acceptance of Dr De la Rue's gift, and is clearly stated by them in their report to Convocation.

They were satisfied that the arrangements already made (the refractor and building) were 'suitable to meet the requirements of astronomical teaching in the University;' and they admit that no fresh application in aid of astronomical research might have been expected for some years. Nevertheless 'there are other interesting and important branches of astronomical research recently opened out by the rapid advance of scientific inquiry,' and the 'Committee feel that the conditions of the question are entirely changed by the proposal of Dr De la Rue to present to the University his own instrument, already famous in celestial photography, and thus to anticipate

* *Univ. Gazette*, February 11, 1873.

† The foundation of such an observatory had been vigorously discussed at the council meetings of the Royal Astronomical Society; indeed, the question which had the honour of first proposing it was in itself debated with some warmth.

an improvement which, at some future time, the University would itself probably be desirous of making.*

One other point should be noticed with regard to this new feature in the observatory. The term 'astronomical physics' has somewhat changed its meaning since 1874. It then included astronomical photography almost completely, as well as spectroscopic work; to-day we should not be so ready to call all photography 'astronomical physics.'

It must not be supposed, therefore, that in adopting this title for the observatory Pritchard meant to devote all, or even the greater part of his attention to the spectroscope. It was rather of the photographic camera that he was thinking, and of this he never lost sight in his subsequent work, though the spectroscope was practically never used. This was also the view of 'astronomical physics' taken by De la Rue, as will be clear from the following interesting letter, apparently intended to be laid before the committee on his proposed gift. The 'use to which he would like to see his reflector applied,' viz., the 'determining whether or not the moon has a physical libration,' was one of the first pieces of work undertaken by Pritchard, but we should, perhaps, now hesitate to call it 'astronomical physics.'

'110 BUNHILL ROW, E.C.,
'October 21st, 1873.

'MY DEAR PRITCHARD,— . . . I cannot give you a better illustration of the fact that in order to complete your equipment of a physical observatory at Oxford you ought to possess not only as perfect a refractor as you can command, but also the means of photographic work, than to recall to your recollection that the Royal Society thought it expedient to furnish Dr Huggins's observatory with a stand on which both a refractor and reflector could be placed. Dr Huggin

* *Univ. Gazette*, November 18, 1873, p. 310.

has, in fact, two telescopes, and apparatus for interchanging them as required.

‘The reflector supplements the refractor in several ways—(first) you cannot obtain photograms of celestial objects in anything like perfection with an achromatic achromatised for the visual rays; (second) in spectroscopic work the ordinary refractor does not afford the opportunity of grasping the chemical spectra—indeed the material (glass) precludes the possibility of so doing with any form of refractor; (third) in studying the colours of stars and planets the reflector, especially the silvered glass speculum, presents manifest advantages.

‘Were it not for the inherent difficulty of the open tube in case of reflectors, I should give the preference to the reflector for *all* purposes. The open tube increases the atmospheric disturbing causes by introducing in addition to external currents the currents within the tube (even a lattice tube).

‘Consequently one is enabled to use a refractor under circumstances (difference between internal temperatures, etc.) when the reflector does not perform perfectly.

‘One use which I should like to see my reflector applied is the determining whether or not the moon has a physical libration; for this purpose, photograms of this planet would have to be taken as often as practicable, and the original negatives measured by means of a properly constructed micrometer, so as to determine the apparent distance of selected craters from the moon’s limb—after allowance for the shifting produced by the optical (latitude), the orbital (longitude) and terrestrial station librations, the residue would be the true libration due to the centre of gravity not coinciding with the centre of figure. . . .—Yours very sincerely,

‘WARREN DE LA RUE.’

While the refracting telescope was being constructed by Mr Grubb, the building to receive it had thus expanded into the ‘New Savilian Observatory for Astronomical Physics

at Oxford.' For a more detailed description of the observatory I must refer those interested to two papers by Professor Pritchard.* I content myself here with a short extract from the first paper, characteristic of the writer.

'The revolving domes are peculiar in their construction. Inasmuch as by the great liberality of the University permission has been given to place this observatory in the most convenient position within their beautiful park, it was thought proper to consider the architectural character of the building, at anyrate to the small extent permitted by the astronomical exigencies of the case. With this view the form of a lofty, truncated dome was selected for the revolving roofs, rather than the usual and convenient form of a drum. This necessitated difficult and unusual contrivances for the shutters.' The contrivances first devised were indeed unmanageable, and some years later had to be replaced by others. What are the architectural merits of the domes I must leave to others to judge ; I have heard them abused.

This extract is not complete without a footnote appended to it in the original directly concerning the park, but leading up to some considerations on the general attitude of the University towards science : and I therefore reproduce this footnote also.

'The ground for this park, consisting of about sixty acres, was purchased and laid out by the University, and then, with admirable liberality, thrown open to the public. The situation of the new observatory is remarkably fortunate, and free from any injurious obstruction to the view in every direction. Nevertheless it lies within easy distance from and communicates with the University museum, where are to be found the lecture rooms and laboratories of the various scientific Professors. This museum, again, is another instance of the munificence of the University in providing at

* Monthly Notices, xxxiv., p. 49, and xxxvi., p. 1.

vast cost for the wants of her students in the natural sciences. Should the University see fit to assign, as is proposed, a portion of the park contiguous to the new observatory for the purposes of a botanic garden, then this remarkable aggregation of appliances for every branch of natural philosophy round a common centre will form an arrangement which, for compactness and completeness, has no present rival in the world—a monument and pledge of the generous care of a true *Alma Mater*.'

We have here Pritchard's testimony to the liberality and the liberal spirit of the University. Many other such passages might be quoted from his writings. He was deeply impressed by the readiness with which the University listened to the demands made upon its resources by the newly-established faculty of science. It may not be generally known how lavishly the University has, during the last half century, spent money in the endeavour to do justice to studies hitherto neglected by its students—I say hitherto, for in spite of this endeavour the science schools do not yet take their proper position in comparison with others. There is an inertia about old institutions which is perhaps adequate to explain this tardiness of apparent result. But the University has generally responded when application has been made to it in a sound cause, by a man who could state a strong case. Pritchard was recognised as a man of this kind; and he on his part was prompt to recognise the liberal spirit of the University. But it was a considerable achievement to convince the University of Oxford of the necessity for their building an astronomical observatory—perhaps Pritchard's greatest achievement: and I have ventured to take this view in the introductory chapter (see p. 217).

The new observatory was not built in a day, though we need not follow the details of its construction and the trials of the Savilian Professor in the meantime. In the

second of the above-mentioned papers read to the Royal Astronomical Society on November 12, 1875, the building is declared complete, and the Professor tenders his grateful acknowledgments to Mr Grubb and Mr Charles Barry for their great care and skill. The engineer, Mr Baly, was no longer alive, but letters from De la Rue refer to him in terms of high praise.

There were, however, considerable trials and annoyances for the Professor in the building of the observatory. The details did not work out as he at first hoped, especially the shutters, and a new form was devised. The contractors did not fulfil their engagements to time; and the total expenses were found to be more than £1000 in excess of the grants approved by Convocation. Finally, when Convocation was petitioned, May 20, 1875, for money to discharge these excess bills, the petition was refused by one vote (25 to 24); but a wish was generally expressed that the application be repeated, and it was then acceded to (June 3, 1875).

To this account of the establishment of the observatory it should be added that Dr Gassiot (who received an honorary degree at the same time as De la Rue) presented a valuable spectroscope to the University, and the thanks of Convocation were conveyed to him by decree of November 17, 1874.

The observatory being completed, the next step was to appoint an assistant or assistants. Provision for an assistant had been made by Convocation, and the appointment was made during the progress of the building. It would be difficult to over-estimate the good fortune which secured Mr W. E. Plummer (now Director of the Liverpool Observatory) as the first assistant. He was thus identified with the University observatory from the very beginning until within a few months of Professor Pritchard's death, and during the whole of that time was conspicuous for un-

swerving devotion to the observatory and a skill in carrying on its work far in excess of what might have been reasonably expected from the conditions of his appointment. Professor Pritchard was already an old man when the observatory was built. His mental activity remained unimpaired to the last, but bodily infirmities came upon him, and he was in consequence often compelled to conduct the affairs of the observatory from a distance. That he should have done this with such conspicuous success is in great measure a testimony to the zeal and ability of his assistants, and especially to the senior assistant. Mr Plummer acted on many occasions for the Professor, not only at the observatory, but elsewhere—as, for instance, at the International Congress on the Astrographic Chart at Paris in 1887. I cannot but feel how much more adequately the account of Professor Pritchard's life at Oxford would have been treated by Mr Plummer, who knew it all personally; but circumstances would not allow of this, and I may perhaps derive some satisfaction from the consideration that at least I am able to say something which he could not of the great services rendered to the observatory by himself—services which Professor Pritchard so constantly acknowledged during his lifetime, and would have been so anxious to have placed on record here.

Mr W. E. Plummer came to Oxford from Mr Bishop's private observatory at Twickenham, where he had been for five years. Previously he had been at the Royal Observatory, Greenwich, 1864-1868. He sent an account of his work and qualifications to Professor Pritchard on June 4, 1874, together with a letter from Mr Hind, the senior assistant at Mr Bishop's observatory, and was forthwith appointed. The buildings at Oxford being not yet completed, Mr Plummer did not remove from Twickenham immediately; but his duties had practically commenced on July 2, when he sends to Professor Pritchard an account

of a visit to Lambeth, where the domes were being constructed. Several such visits were made and reported upon. He also, in August, drew up a list of books necessary for the library of the new observatory, and was assisting Professor Pritchard in other ways in July and August. His definite appointment and removal to Oxford was dated from September 2, 1874; and his initial salary fixed at £160, leaving a very narrow margin of £40 from the annual grant of Convocation for unskilled labour and contingencies. It was soon seen that this was not enough, and the grant was raised to £300 from January 1, 1875, allowing of a servant at £50 a year, the rest going for taxes, gas, water, coal and photographic expenses. Considerable economy was even then necessary in all transactions.

When work was definitely commenced, however, it soon became clear that more assistance was required. There was no house for the observer (a fact which Mr Plummer deplores in his letters; he had not been able to get a house within easy distance of the observatory, and suited to his small salary, at all); and the strain of working two equatorials besides the minor instruments, from a distance, was far too great. The applications to Convocation has already been numerous, and hesitation was felt about making any more at the time. Dr De la Rue came to the rescue, and offered an annual grant of £100 for three years (ultimately four) for the provision of a second assistant. Mr C. A. Jenkins, of the Royal Observatory, Greenwich, was thus appointed, and he also remained at the observatory through practically the whole of Professor Pritchard's directorate.

There was a third member of the establishment who, though not styled an assistant, was by no means an unimportant part of the whole. It would be somewhat difficult fully to describe the various accomplishments of Mr John Mullis, and the numerous uses to which they have been put

in the history of the observatory. As mechanic, carpenter and gardener, he is equally competent and hard-working; equally ready to describe the course of an otherwise forgotten drain, to make a model of a new micrometer, to build an observatory hut, or to adapt a bicycle wheel for driving a dynamo. He is still at the observatory, and long may he remain so. His name will not occur again in these pages, but his work was none the less essential to the smooth working of the institution and the success of the researches there carried out.

CHAPTER V

WORK IN THE OXFORD OBSERVATORY

THE history of the new observatory was prosperous from the commencement, albeit rather in the direction of research than of education. But this was only a movement in the line of least resistance. I have already referred to the fact that the lavish expenditure of the University upon scientific institutions and apparatus has not yet produced any very startling result in the schools. Such a result was perhaps scarcely to be expected, and may not be desirable. In the opinion of many competent judges, the chief strength of Oxford lies in her great school of *Literæ Humaniores*, and until 1853 this school had no rival except that of Mathematics, which it completely overshadowed. In 1853 two new schools were founded, that of Natural Science and the combined school of Jurisprudence and Modern History, the former of which may be considered an offshoot of Mathematics, or at least an allied growth with it, and the latter similarly allied with *Literæ Humaniores*. And in the new schools the same disproportion was manifested. The school of Jurisprudence and Modern History flourished from the first like its parent, *Literæ Humaniores*, and in 1872 was divided into two separate schools, each of which has grown healthily; as has also the school of Theology, added in 1870. But the Natural Science school was a weakling, like Mathematics in Oxford, and for many years showed only the feeblest signs of life.

It may be that the previous existence of a strong growth

like the school of *Literæ Humaniores* is inimical to the well-being of organisms not akin to it ; or again, without assuming any deleterious influence of one organism or the other, the flourishing of the former may be an indication that the environment is not suited to the latter. In the one case vigorous efforts to cultivate the new growth might be successful, though the old growth might possibly suffer in the process ; in the other case such efforts would not be so hopeful. But leaving such speculations on one side, there seems to be no doubt of the fact that the teaching of science as a part of the University curriculum is attended with great difficulties ; and if Pritchard achieved nothing very striking in this direction, it need excite no surprise. He never neglected this part of his work ; his formal lectures were continued, to those few who showed an interest in astronomy, throughout his tenure of office, excepting the last year or two, in which Mr Plummer lectured for him. And the MSS. of these lectures show that they were prepared with great care ; indeed, his heart had been in educational work all his life, as his success at the Clapham Grammar School is sufficient to demonstrate.

He was untiring in his efforts to make practical work with astronomical instruments easy and attractive to students. Those who have ever done any teaching work of this kind know the difficulties of it. The conditions of working in the dark and in the open air are perplexing and often uncomfortable ; astronomical apparatus is not multiplied so readily as laboratory apparatus, and several persons must be instructed at the same instrument, awaiting each their turn. Finally, the weather enters as a distractingly uncertain element. These difficulties Professor Pritchard resolutely attacked. After giving elementary instruction for some years in the open air, he built in 1885 a students' observatory on the roof of the lecture room, in which he placed the instruments from the old museum observatory, and some of his own which he presented to the University.

This situation not being found to give a steady enough foundation, after a few years' experience he determined to build a more suitable structure on the ground, which, however, was only completed very shortly before his death.

To those students who had acquired some knowledge of the elementary facts about instruments, the course of the researches being conducted by means of the chief instruments of the observatory was then explained. Much more than this could not be done in the few hours that students were able to devote to astronomy, which was never more than a mere incident in their course of study ; but considerable pains were taken to achieve so much. The peculiar constitution of the University made it practically impossible to do more.*

Pritchard was not satisfied with this state of things, as may be imagined, and several times looked about him for other students more ready to devote themselves and their time to his instruction. In 1881 he refers to 'three very different classes of persons' towards whom he considers he has duties. 'First there are the students and their requirements in regard to the studies prescribed by the University. Next to these there are graduate members engaged in public tuition, who have from time to time applied for more advanced and complete information than is required for the purposes of the schools. And thirdly, there is a large and increasing, and, in some points of view, a very important class of young men, whether connected with the University or outside of it, who, without possessing any considerable knowledge of mathematics, desire to obtain as much acquaintance with a fascinating science as may serve for a recreation or paragon in leisure

* Extract from the report of the Savilian Professor on June 4, 1879 :—' Until some material advantages are offered to students, in some degree corresponding to those valuable and numerous rewards which are at once reaped from the other studies of the University, I can hardly expect that justice can be done to the difficult subject of astronomy, or to what I believe to be the unusually great opportunities provided by the University for the students at the observatory. In plain language, the study of astronomy is supposed not to pay sufficiently well in the public examinations to encourage students to take it up.'

hours. Each of these three classes has claimed the Professor's attention during the last year.'

In the next report (1882) he is still impressed with the same idea.

'I have adhered to the plan proposed for the lectures which I indicated in my last report (June 1881). It is, as there explained, intended to embrace three different classes of persons; thus lectures were offered to the students on the lunar and planetary theories, and on more elementary and practical subjects. On three occasions I invited the attendance of schoolmasters of elementary schools in the city and its neighbourhood, and to some twenty of these important officers I expounded what I considered to be the proper method of teaching geometry and cognate subjects. It seemed to me that this attempt was within the lines of my duty to the University. On account of the apparition of a comet which was expected to present features of unusual interest, I also offered lectures on the whole theory of these singular bodies, both mathematical, observational and physical. I regret to say that no member of the University availed himself of the offer. The stimulus which is applied to the cultivation of other branches of learning, by means of scholarships and other modes of practical and material encouragement, is non-existent in the case of astronomy. The consequences are obvious, and cannot be effectually removed except by extending to that branch of science that same fostering hand which is so bountiful in regard to other studies.'

Enough has perhaps been said to show the kind of effort made in the direction of teaching, and the reasons why only a moderate success was to be expected. In later reports no special comments are made on the subject, and the Professor seems to have accepted the situation and turned his attention more completely to research; and here the success of the new observatory was assured from the very beginning.

Two great pieces of work, on stellar photometry and stellar parallax, were completed, each of which was crowned with a medal ; and the inception of a third of even greater magnitude occupied the closing years of Pritchard's life. Besides these, several other researches of considerable importance were undertaken and brought to a successful issue; but I have Pritchard's own authority for dividing up the seventeen years of his labours into periods, according to the aforesaid three great pieces of work. In his report for 1891 he writes :—' The completion of the whole scheme of the determination of stellar parallax, as originally conceived, may be said to constitute the second epoch in the history of the University observatory. The publication of the photometric work in the *Uranometria Nova Oxoniensis* I regard as the first. In like manner the third epoch now commences with the construction of the photographic star chart, or, at least, that zone of it which is assigned to this observatory.' The division between the first and second epoch in 1886 was well marked, one work being completed before the other was projected ; but in 1891 much had already been done on the star chart—for it turned out to be no small labour to get a suitable instrument, as Pritchard had done. I mention this lest it should appear from the comparison of the date (1891) with that of Pritchard's death early in 1893, that he had not time to accomplish much in the third undertaking. I shall presently show that this was far from being the case. The work of the astrographic chart really began in 1887 with the International Congress.

I do not consider it necessary here to describe in detail all the pieces of work done at the observatory during Pritchard's directorate. For the purposes of biography it will be better to select one or two of them as representative. But before proceeding to such description of any, I give here for reference a very brief summary of his Annual Reports to the Board of Visitors, presented each year in June.

BRIEF SUMMARY OF THE RESEARCHES, AS SHOWN IN
ANNUAL REPORTS TO BOARD OF VISITORS.

1876. Double stars (34 nights). Photos of moon (150). Venus (21), Jupiter (18). Saturn's satellites (32 nights). Observations of chromosphere (1 day).

1877. Photos of moon (426). Double stars (259 measures of 117 stars). Orbits graphically determined (several). Comets (3 observed on 16, 48 and 23 nights; and elements and ephemerides computed). Saturn's satellites (88 measures). Chromosphere (22 days).

1878. Photos of moon (600). Double stars (110 measures of 45 stars). Orbits of double stars (2). Comets (2 observed on 4, and 14 nights; 5 orbits computed and 1 ephemeris). Saturn's satellites. Pleiades (31 stars in R.A. and Dec., as well as distance with duplex micrometer). First volume of observations published.

1879. Photos of moon (300). Measurements of these for physical libration, and diameter. Comets (2) observed. Pleiades measures with duplex micrometer.

1880. Lunar libration discussion nearly completed. Pleiades measures. Also measures on 39 Messier.

1881. Lunar libration completed. Memoir on possibility of accurate measurement of photographs. Comets. Double stars. Measures on 39 Messier.

1882. Memoir of last year (on photography) completed. Pleiades measures discussion complete, nearly ready for press. *Wedge photometry commenced*. Comet Wells (brightness of). Hours of bright sunshine.

1883. (No report printed in the *Gazette*, nor preserved at the observatory. Professor Pritchard was in Egypt in the early months of the year.)

1884. Three memoirs appear in Vol. xlvii., Mem. R.A.S., from this observatory. 'On the Moon's Photographic Diameter and on the Applicability of Celestial Photography

to Accurate Measurement' (Pritchard). 'On the Solar Motion in Space' (W. E. Plummer). 'Photometric Determination of the Relative Brightness of the Brighter Stars north of the Equator' (Pritchard). A memoir on Pleiades nearly ready. Photometric work preceeding, and *Uranometria Nova Oxoniensis* projected.

1885. Pleiades memoir complete. Photometric work complete.

1886. *Uranometria Nova Oxoniensis* published, and gold medal of Royal Astronomical Society awarded. Novæ Andromedæ and Orionis watched. *Parallax work projected*.

1887. Parallax of 61 Cygni determined photographically. Parallaxes of μ Cassiop. and Polaris commenced. Some photographs of Pleiades with De la Rue reflector.

1888. Parallax work proceeding (ten or twelve stars). Testing of capacities of two mirrors of different focal lengths for the Royal Society.

1889. First volume of Parallax being printed. De la Rue gave astrographic telescope, and testing of trial object-glasses commenced.

1890. Parallax work proceeding. First volume of results printed and distributed. Testing of trial photographic objectives.

1891. Parallax nearly completed down to second-magnitude stars. Preliminary investigations for star chart.

1892. Parallax work complete, and volume ready for press, with a history of the subject. Photometry of specified areas for star chart. Nova Aurigæ.

It will be gathered from the foregoing summary that besides the memoirs contributed to the Royal Astronomical Society and the Royal Society, four volumes of observations have been issued as the definite result of work at the Oxford University Observatory. The first volume, though it contains some excellent work, does not call for any very special mention.

In a brief introduction, the director gives some particulars of the observatory and its work up to the end of 1877. Then follow the observations of Saturn's satellites, double stars, comets; and the calculations of the orbits of ξ Ursæ Majoris, 70 Ophiuchi, and μ^2 Bootis—all excellent work, but not very novel; well adapted for showing the capacities of the observers (generally Mr Plummer) and the instruments, and by no means useless, but not of the same striking character as the work which was to follow; like a serious and earnest trial of a racing crew, and no mere paddling, though not the actual race itself. There was no doubt about the race when it did come. Such a metaphor would not apply to the work of most observatories, which is extended over many years, if not centuries, on a uniform plan. But Pritchard worked in a different way, in comparatively short, sharp bursts; and his undertakings might very well be compared to races, with their well-marked start and finish, their definite result, and their reward for victory.

The second volume of publications of the University observatory might have been expected to contain the work on lunar libration. It will be remembered that this was a research indicated by De la Rue as suitable for the employment of his reflector (see page 267), and Pritchard lost no time in complying with the wishes of his friend and benefactor. Some thousands of photographs of the moon were taken with the instrument by the second assistant, Mr Jenkins. Many of them were carefully measured with a 'measuring engine,' also provided by the liberality of De la Rue, and the results were collected and discussed, as appears in the above summary. In 1880 and 1881 Pritchard announces that the discussion of the libration is nearly complete, and suggests that when complete it will fitly form the next volume of the publications. But the volume never appeared. There was some hitch in the final discussion—what I do not exactly know—and the work was laid aside. The

papers are still in the observatory, and I shall hope at some future time to examine them. But Pritchard certainly saw some reason for withholding the publication. I do not think there is any reason for not stating this fact plainly. I have lost a little time myself hunting for the published results of which references in reports, etc., led me to expect the existence; and to have it down in plain words that the results were never published may save others similar lost time in searching. It is clearly another case similar to the optical tables. Pritchard found, when the work was all but complete, that there was some flaw, and withheld the publication. It is not likely that, as in the former case, the whole work was practically useless; but there was some cause for dissatisfaction, and the work was laid aside. It would have been more satisfactory to know the exact difficulty from Pritchard himself, but I cannot find that he has left any record of it, and we must therefore be content with a general explanation. Pritchard was sufficiently successful on other occasions to allow of the plain statement of this comparative failure. It is possibly the duty of a biographer to draw attention to such failures more particularly—for it is undoubtedly an encouragement to others to know that the undertakings of a successful man are not always successful.

The work on the lunar photographs was, however, not without a useful issue. Incidentally it was made clear that photographs were susceptible of very accurate measurement; and this was a most important fact, and, *at the time*, comparatively new. That a photograph is a very close copy of the original must have been obvious from the first—it was the essential merit of a photograph. But the demands of astronomers are of the most exacting kind and it was in 1880 not yet clearly established that they could be satisfied by the photographic method. Those who have never examined a photograph closely would be astonished to find what an amount of distortion can

escape notice in a general inspection by the eye. A paper print of a portrait, for instance, is always more or less distorted, owing to the different shrinking of the paper in different directions. If the paper has a well-marked grain or structure, as is usually the case, the portrait may be given a long face or a wide face by suitably placing this grain; and yet the eye would still recognise the likeness. But a measuring apparatus would at once reveal these defects; and such a photograph would be useless for astronomical purposes unless special precautions were taken.

We now know that in a photograph *on glass* such shrinkage or distortion is sufficiently small to render a photograph available for measurements of great astronomical precision; and Pritchard took an important share in the work of establishing this fact. A few quotations will show his historical position.

On the occasion of the transit of Venus in 1874, a large number of photographs of the sun, with Venus in transit, were taken by the British expeditions; and it was hoped that careful micrometric measures of the distance of Venus from the sun's limb (as the edge of the sun is termed) would supplement or even supplant the eye observations of the moments of ingress and egress. But after many attempts and much labour, this hope was relinquished. I quote the words of Sir G. B. Airy, then Astronomer-Royal, under whose superintendence Major Tupman and his computers worked.

' After laborious measures and calculations, it was thought best to abstain from publishing the results of the photographic measures as comparable with those deduced from telescopic view. The considerations which led to this decision are stated by Major Tupman in a paper in the "Monthly Notices," R.A.S., Vol. xxxviii., p. 508. They are mainly embodied in this—that, however well the sun's

limb on the photograph appeared to the naked eye to be defined, yet on applying to it a microscope it became indistinct and untraceable, and when the sharp wire of the micrometer was placed on it, it entirely disappeared.'

Again, referring to some images taken with Janssen's apparatus—

'They have not been further reduced. The ardour of the observers had been much cooled by the apparent general failure of the photographic principle, and they were unwilling to spend further time on these reductions.*

'1881, June 10.

G. B. AIRY.'

This is historically a most important statement. Airy had taken the greatest interest in everything connected with the transit of Venus, and although he was getting old, and was not able to deal with the mass of work done at the royal observatory with the vigour and keenness of his earlier years, he would not have made any such sweeping assertions without being well satisfied of their general correctness. We may lay all due emphasis on the fact that in 1881 Airy regarded the 'photographic principle' as having 'generally failed.' Fortunately for astronomers, this decision was reversed within a very few months, both in England and America. In May 1882 Pritchard wrote his memoir 'On the Moon's Photographic Diameter and on the Applicability of Celestial Photography to Accurate Measurement' (Mem. R.A.S., Vol. xlvii.); and on p. 16 of this memoir he remarks, as the summary of a preceding discussion :—

'So far, then, it seems that the accuracy of the photographic method is established on a secure basis;' and appends a footnote:—

'Since this paper was completed for publication, the elaborate discussion by the American astronomers of the

* *Transit of Venus*, 1874. Printed at H.M. Stationery office. Appendix V., p. 19.

results of the photographic measures of the transit of Mercury in May 1878, have amply confirmed the conclusions regarding the reliability of photography properly applied as derived from the present investigation.' (See *Am. Journ. of Sci.*, Vol. xxii., Nov. 1881.)

No comments of mine are needed to supplement these striking phrases, which show at once that Pritchard was one of the first to pin his faith on photographic measurement with good reason. But the work and faith of De la Rue must not be forgotten. It was De la Rue who had first applied the photographic method in 1860 to a solar eclipse, and who had measured his photographs with great care and labour. It was De la Rue who gave his own instrument to Oxford, in order that such photographs might be taken; who suggested their measurement; who bought and presented the micrometer to measure them with; and whose keen interest in the result was doubtless a powerful factor in the progress of the work. It is no disparagement to Pritchard to recall these facts; the pair of friends each needed the other, and by their happy coalition work was done which neither might have done alone, but in the accomplishment of which both had ample opportunity to show their powers, whether of munificence and suggestion, or of appreciation, skill and determination.

Some years later, in the parallax work, Pritchard was to test the photographic principle still more severely, but after this first essay (with which, as I have already remarked, he was not quite satisfied) he turned his attention in a quite different direction, and it is from this point that he considered the real history of the University observatory to begin. I proceed to describe very briefly the scope of the photometric work summed up in the *Uranometria Nova Oxoniensis*. In an introduction to this volume, Pritchard has given such an admirable account of the work and its

historical relations, that little more than quotation is necessary. Much of what follows is accordingly taken bodily from this introduction; but to avoid the use of inverted commas, of which there are already so many in these pages as to tire the eye, I state my acknowledgments here.

The *Uranometria Nova Oxoniensis* is a large octavo volume containing 117 pages of tabular matter, and 27 pages of introduction. It represents the work of three years on the photometry of stars visible to ordinary and unaided eyes, from the North Pole to about ten degrees south of the Equator. This work was one of the earliest attempts to *measure* the brightness of the stars by an instrument specially designed for the purpose, called the Wedge Photometer. Up to this time systematic classifications of the stars according to their brightness had been conducted by means of the eye alone, or the eye aided merely by a telescope; and the fundamental principle of working was the comparison of two stars to see which was the brighter, or whether they were so nearly equal in brightness that no difference could be detected. It is clear that in this way a number of stars could be arranged *in order* of brightness; or that a number of classes could be formed, each containing stars brighter than those in the class below. But it is also clear that the differences between one class and the next might not be always the same; there would at least be no guarantee of uniformity in these differences. It might turn out that the eye was so constituted as to assign a constant difference between the classes throughout, but this would have to be established by independent means. Curiously enough it did turn out very nearly so. Ancient astronomers (Hipparchus and Ptolemy) divided the stars into six classes. They assigned the 'first magnitude,' to a small group of the brightest stars, and then proceeded step by step in successive groups to the 'sixth magnitude,' which included all stars shining with the feeblest lustre admitting of appreciation by the naked eye. When

systematic measurements were brought to bear on these classes, it was found that each was about $2\frac{1}{2}$ times brighter than the class below. It may excite surprise that the difference in lustre was so marked ; and it must not be supposed that the brightness of the stars can be arranged in nearly uniform classes differing so abruptly one from another. Intermediate steps between these classes were soon established. Ptolemy himself sub-divided each magnitude into three, an amount of precision which seems to have been subsequently abandoned by his successors. His work remained practically unimproved from his day (A.D. 150) to that of the elder Herschel at the close of the eighteenth century. In this interval some few attempts were made to improve Ptolemy's estimations—as by Abd-al-Rahman Al Sûfi (A.D. 930), Tycho Brahe (*circa* 1570), Hevelius (*circa* 1680) ; while Bayer (1601) applied the letters of the Greek alphabet to denote the stars in a constellation more or less in the order of brightness, without any re-examination of Ptolemy's work. Finally Flamsteed (*circa* 1689), the first Astronomer-Royal, and the first astronomer who applied the telescope to systematic celestial measurements, re-introduced the sub-divisions of a magnitude into thirds, by means of the notation now in general use ; but in other respects exhibited either negligence or unconcern in his estimations of relative stellar brightness. It was this disregard of precision on Flamsteed's part which mainly induced Sir William Herschel * to turn his own attention to the subject. He divided a constellation into small groups of two or three or four stars of nearly equal brightness, and he then arranged the stars in these small groups in the order of their lustre. Stars common to two groups formed the connecting links. It was, however, no part of his intention to form a complete catalogue of magnitudes, but to record the means of detecting any—the slightest—variation which might occur at future periods in any of the stars form-

* *Phil. Trans.* 1746, p. 166.

ing any of his groups. His son, Sir John Herschel, during his busy life at the Cape of Good Hope (1835-1838), proposed to apply to the southern heavens that same sort of scrutiny which his father had applied to the northern. But he extended and somewhat modified the scope of the work, so that it might have furnished him with a systematic catalogue of magnitudes if completed. Further, he invented a photometer of a rude kind, but the first photometer applied to the brightness of the stars. It consisted of a pole, a small lens of short focus, a few strings and a graduated tape. With these materials properly arranged, he could obtain in the focus of the lens a microscopic image of the moon, and this he could view in any direction, and at any measured distance from the eye, so that, being brought into the line of sight of any particular star, he could alter the distance of the tiny image, until it and the star appeared to be equally bright. In this way the brightness of some sixty-nine stars were compared with that of α Centauri, and the results were tabulated.

About this time Argelander was at work at Bonn on astrometry, and completed a large systematic catalogue. In 1843 he published his *Uranometria Nova*, containing the estimated magnitudes of all the stars visible to the naked eye in Central Europe. This, in fact, is the first successful attempt made by modern astronomers to arrange in an original and independent catalogue the relative brightness of the stars. Argelander has not recorded the details of the method which he adopted to secure his results, nor is it possible to say by what means or mental impressions he preserved a fair uniformity of scale, and a general conformity to the magnitudes recorded by his predecessors.

His first work was soon followed by another of far greater magnitude and importance. With the most able assistance of Drs Schönfeld and Krüger, he recorded the approximate places and brightnesses of about 324,000 stars (down to

the ninth magnitude), using in this case a telescope to assist the eye.

Other workers in the field were Heis, Houzeau, Flammarion and B. A. Gould.

After this rapid glance at the history of the determination of star magnitude by estimation, we will briefly consider the various proposed forms of photometer for *measuring* the brightness and expressing it as a physical quantity.

Almost the first devised was that of Sir John Herschel mentioned above, wherein a minute image of the moon was placed at different distances from the eye. The scale of the photometer was thus expressed in *distance*, and the brightness was inferred from the law that it varies inversely as the square of the distance.

About the same time, Steinheil, at Munich, was arranging a more refined instrument, which was subsequently used by Seidel. It consisted of a small telescope with divided object-glass, each of the halves of which was furnished with a reflecting prism, so that by means of suitable mechanism the images of two stars might be viewed side by side in the telescope, and thus compared.

Zöllner devised a photometer in which he successfully applied Arago's suggestion of the method of polarization. The comparison star in Zöllner's instrument was formed artificially by means of a lamp, the light of which could be reduced by double refraction through a measurable quantity, until it was judged to have the same intensity as that of any required star in the same field of view as the artificial star itself. This photometer has been largely used, chiefly by Zöllner himself, Peirce, Wolff, Müller and Lindemann.

Professor Pickering of Harvard dispenses with the divided object-glass of Steinheil and Seidel, with the lamp of Zöllner, but combines other principles of both instruments in his 'Meridian Photometer.' There is a telescope tube placed

horizontally at right angles to the meridian in which are placed two object-glasses, with their axes slightly inclined to each other, and each armed with an adjustable reflecting prism. Images of Polaris and of another star to be compared are thus brought near together, and equalised by the polarisation method of Arago and Zöllner.

In all these instruments the light of the star is compared directly with the standard light.

We now return to the *Wedge Photometer*, which is of a different kind. It is constructed on the principle that light, in passing through a transparent homogeneous medium, loses an amount of intensity depending on the thickness passed through. When we adopt the usual definition of stellar 'magnitude,' the law of this absorption is as follows. The alteration of apparent magnitude is directly proportional to the thickness of the medium passed through. The medium adopted in the wedge photometer is a glass prism or wedge of very nearly neutral-tinted glass (we may quote the exact dimensions of one such wedge, viz., $6\frac{1}{2}$ inches long, 1 inch broad, and 0.145 inch thick at one end, 0.02 inch thick at the other). Cemented to it is a similar wedge of white glass placed the reverse way, the whole forming a glass plate of uniform thickness. The white glass, however, does not absorb the light of a star viewed through the plate, while the neutral-tinted glass does; and the absorption is greater near the thick end of the neutral-tinted wedge, less near the thin end. It will be readily seen, from the law of absorption above quoted, and from the fact that the thickness of a wedge is directly proportional to the distance from the edge, that the alteration of apparent magnitude in a star caused by the absorption of this wedge is directly proportional to the distance from the edge of the point through which the star is viewed, and in practice this principle is made use of as follows.

The wedge slides in a groove on the brass cap of the

eye-piece of any telescope, close to the chromatic eye-lens, and is thus placed between the eye of the observer and the telescope. In the focus of the eye-lens is a diaphragm, pierced with a number of small holes, which vary from the hundredth of an inch to a quarter of an inch in diameter, and in one of these small circular holes the telescopic image of a star is carefully placed, and there viewed through the wedge. Further, the eye of the observer is directed along the axis of the lens and of the telescope by means of an external eye-hole close to the wedge, and varying from one-twelfth to one-fourth of an inch. This direction of vision is important.

Looking then through the wedge at the image of a star, the observer slides the wedge in its groove until *the image is just extinguished by the wedge*. A scale on the wedge and a fiducial mark on the brass cap give the position of the wedge when this happens; and usually the image of a star is extinguished five times independently, the mean of the five scale readings is taken, and the result is called the *wedge reading* for that star.

From what has been said above, it follows that the difference of wedge readings for any two stars is directly proportional to their difference of magnitude; or in symbolic language, if m be the magnitude of a star and w the wedge reading, then

$$m = A + Bw$$

where A and B are two constants. The constant B is independent of weather, and is called the scale value of the wedge. The constant A , representing the magnitude of a star just extinguished at the zero reading of the wedge, is affected by the state of the sky on any particular night, and is deduced from observations on a standard star, which must be repeated sufficiently often to follow any changes in the weather. Generally speaking, the determination of this constant presents no difficulty. But the determination of the constant B is fundamental, and calls for particular notice.

All the measures are made in terms of this scale value, and any error in it affects all the results, in the same way that all measures of length depend upon the yard measure or other unit of length with which they are made.

The method adopted by Professor Pritchard for the determination of this scale-value is described by him in *Mem. R.A.S.*, Vol. xlvii. (under date May 11, 1883). It depends on the use of a doubly refracting prism of quartz and a *Nicol* prism, but the details need not be repeated here. Using the scale-value so determined, the deduced star magnitudes were in good accordance with those found by other observers.

Curiously enough, reason has since been found for doubting the accuracy of this method for determining the scale-value. In the *Monthly Notices* for March 1890, Dr Spitta describes some experiments in which he applied the wedge photometer to the extinction of some artificial lights, the relative intensity of which was previously and independently known. The scale-value had been determined at the Oxford University Observatory according to the method described by Professor Pritchard, and was subsequently confirmed by Dr Spitta using the same method; but to his astonishment Dr Spitta found that the consequent evaluations of the artificial lights did not agree with the independently known ratios. After some considerable trouble he found that the determination of scale-value was interfered with by internal and other reflections, which, however, could be got rid of by using a suitable diaphragm; and with this precaution he obtained a scale-value corresponding to the known facts; and this value was confirmed by Captain Abney using a quite independent photographic method (*Monthly Not.*, Vol. 1., p. 515). Professor Pritchard promptly re-examined the scale-value of the Oxford wedges, 'duly attending to his (Dr Spitta's) remarks as to the necessity of using a proper diaphragm in order to obviate the internal and other reflections which he regarded as the source of error in his own

case. The result was that no correction could possibly be made in the co-efficient of absorption of the wedge used for the Oxford *Uranometria* (Mon. Not., Vol. I., p. 512). The discrepancy is curious, and has not been explained satisfactorily. Professor Pritchard was, perhaps pardonably, a little impatient of criticism ; and after the brief paper from which the above quotation is taken, wherein he gives the figures on which this conclusion is based, refused to discuss the matter further. There seems to be no doubt that the scale-values adopted for the wedges in the *Uranometria Nova Oxoniensis* are very near the truth,* though Dr Spitta's researches point to the conclusion that this fortunate result must be considered as more or less accidental.

Systematic work with the wedges was commenced at the end of 1881. The wedge photometer was described to the Royal Astronomical Society on November 1881 (Mon. Not., xlii., p. 1), and sufficient observations had then already been made with it to justify the expression of hopes for its great utility and accuracy. The MS. of the earliest observations has by some accident not been preserved, the first MS. book being numbered 2, and the first observation recorded in it being under date 1881, December 22. Stitched to the cover of this book Number 2 is a printed copy of the paper from the Monthly Notices, and the following interesting letter from Dr Huggins :—

'UPPER TULSE HILL S.W.,

'24th February 1882.

'MY DEAR PROFESSOR PRITCHARD,—In 1865 I had constructed by "the last of the Dollonds" an instrument combining Dawes's "aperture diminishing eye-piece" and his "photometer of neutral-tint glass" (Mon. Not., Vol. xxv., p. 229). At the time I took some pains as to spectral uniformity

* In saying this, I anticipate the publication of independent re-determinations made recently by Captain Abney and Dr Spitta.—H. H. T.

of absorption of the neutral-tint glass wedge. On referring to my paper in *Phil. Trans.*, 1866, p. 394, when this apparatus was used for light of nebulæ, I find that I speak on this point in these words:—"An examination of the neutral-tint glass with a prism showed that the absorptive power of the glass for all refrangibilities in the brighter portions of spectrum was very nearly uniform;" and I considered the glass screen I used and also the graduated wedges to be quite uniform enough for *my* purpose.

'I delayed replying to your note to re-examine the wedges and some other specimens of neutral-tint glass I have obtained since 1865.

'The above statement from *Phil. Trans.* is correct so far as the dim metropolitan light we get here permits me to form an opinion.

'There is absorption from about B A-wards, and there is *also a very faint want of uniformity of absorption* in the brightest part of the spectrum.

'Now as to your direct questions:—I. *Star Spectra*. I found, as a rule, that the light of stars after passing through a spectroscope *of the power I used* was too much weakened to allow of good observations below C, and therefore I did not attempt to observe below that point. No doubt nearly all bright stars observed through a single prism under most favourable circumstances for light, "have observable light about and somewhat less than B."

'If one star had a bright line about B, and another had the continuous spectrum about B nearly blotted out by absorption lines, no doubt the wedge estimation would differ (theoretically at least) from an eye-observation by some other method.

'Your second question is, whether practically the *wedge* can be trusted. No doubt that in the case of the *stars visible to the naked eye*, among which there are no *very* red stars, the wedge would give results quite comparable probably with

those of any other method, because any small errors arising from the want of absorptive uniformity would doubtless be much smaller than the unavoidable errors of estimation coming in from other causes. The light about B in any ordinary light, giving a continuous spectrum, takes a very feeble part indeed in influencing our estimation of the brightness of the light.

‘Practically, for your purpose, I should think your apparatus would not lead you sensibly wrong, but, of course, it is open theoretically to such objections as those of Loewy.

‘I think the very faint want of uniform absorption in the brightest part of the spectrum, which is so feeble in my glass as to be scarcely more than suspected, would not sensibly affect your results.

‘Some specimens of neutral-tint glass I have are more perfect in this respect than some others.—Yours sincerely,

‘WILLIAM HUGGINS.’

This letter reminds us of the novelty of the enterprise and the doubtful questions to be resolved at the time of undertaking. The instrument was not yet thoroughly proven. The road to be trodden was a new one: were there pitfalls unavoidable? Pritchard took every precaution against them. He made the first few steps himself, and reported progress to the Royal Astronomical Society; but the ease with which they were made did not render him careless. He was unremitting in his care that his footing should be secure; and especially does this appear in his consultations of the best possible guides to the new country. I am not sure whether a certain characteristic of Pritchard has been made sufficiently clear in what precedes—that, namely, of always asking the best advice he could get. In reading over the raw material—letters and notes of all kinds—this characteristic forces itself prominently into my view; but it may have been lost in the inevitable selection from the incoherent

mass. Pritchard was thoroughly capable of striking out a new line,—the foregoing pages must indeed have been badly written if this does not appear clearly,—but he was desirous, to the point of anxiety, of confirmation by the best authorities available; and his embarking on a new enterprise is always marked by a crop of letters to those in whose opinions he had most confidence. The above letter from Dr Huggins must stand as a representative of a considerable number, wherein the fundamental principle of the wedge photometer is discussed with astronomers of ripest experience in this particular line. This discussion guided, but did not replace, direct experiment at the Oxford University Observatory. The date of the above letter is, it will be noted, some months subsequent to the paper describing the preliminary and successful experiments, detailed to the Royal Astronomical Society in November 1881.

To return to the actual work with the wedge photometer, I give here, in the words of the introduction to the *Uranometria Nova Oxoniensis*, the method of using the instrument. About ten stars were selected for a night's work, such that they could be observed at nearly the same altitude as Polaris, in order that it might not be necessary to correct the measures for absorption of light by the atmosphere. The two photometers A and B were attached to two telescopes, the one of four inches, the other of three inches aperture, each telescope being in a separate dome—the four-inch telescope being under the charge of Mr Plummer, the senior assistant, and the other under Mr Jenkins, the junior assistant. Each observer was independently to measure the several stars specified. The complete plan was that Polaris should be extinguished at the beginning, the middle, and the conclusion of the observations. The readings of the wedge were taken five times with the full aperture of the two telescopes. A cap was then placed on each object-glass, reducing the linear aperture to one-half, and five readings for extinction were again made. The reason for thus altering the aperture was to establish thereby

a check on the former sets of five measures by means of a virtually new instrument.

Each of the other stars whose magnitude was to be compared with that of Polaris was then observed altogether with twenty extinctions consisting of independent sets of five extinctions. The wedge readings were usually brought to me on the following morning, and were reduced to magnitude by the method shown in the example on page 21, on the scale that the magnitude of Polaris should be 2.05. If during the observations any suspicious circumstances had arisen regarding the clearness of the sky in the neighbourhood of Polaris, or of the stars observed, the sky was scrutinized out of doors, and the observations if necessary discontinued.

With this representative programme for a night's work, a campaign of some three years was undertaken and carried to a successful conclusion. In all, 2784 stars were examined, their brightnesses carefully determined, and the results tabulated in a convenient form in the catalogue known as the *Uranometria Nova Oxoniensis*. I hesitate to add further details which might weary those not especially interested, and which those who are will find in the volume itself. But one point of some importance remains to be noticed. The apparent brightness of a star varies with its altitude, because of the varying thickness of the atmosphere by which its light is partially absorbed. The original observations made at the telescope must thus be corrected for this systematic error, and for this purpose a knowledge of the law of absorption of light by the atmosphere is required. Observations were made with this object at Oxford; but 'so important and essential to his inquiry did Professor Pritchard consider an accurate knowledge of the value of the absorption constant that, with his accustomed vigour, he resolved to compare the results of the observations made at Oxford with others determined with the same instrument and observer in some climate steadier and more uniform than

that at Oxford. Accordingly, in January and February 1883, we find him, with his assistant Mr Jenkins, stationed at the Khedive's observatory near Cairo, prosecuting his research with such success that, after a residence of five weeks, no fewer than 3385 wedge extinctions were made. The absorption constant determined at the two stations, though indicating a real difference of climate, differed less than had been anticipated, the respective values from the Oxford and Cairo extinctions being $\cdot 253$ and $\cdot 187$, showing differences of $\cdot 066$ of a magnitude — a quantity about equal to the probable error of observation with the photometer employed.' (Extract from the president's address on presenting the gold medal of the Royal Astronomical Society to Professor Pickering and Professor Pritchard conjointly.—Mon. Not. R.A.S., xlv., p. 273.)

The *Uranometria Nova Oxoniensis* was printed by the Clarendon Press in 1885. In February of the next year the gold medal of the Royal Astronomical Society was awarded conjointly to Professor Edward C. Pickering, Director of the Observatory of Harvard College, U.S., and the Rev. Charles Pritchard, D.D., Savilian Professor of Astronomy in the University of Oxford, for their photometric researches. Professor Pickering had been independently working at the same subject with a different instrument, and had produced a larger catalogue about the same time. The two catalogues have been compared with each other, and with other similar catalogues on several occasions, and considerable discussion as to their respective merits has ensued; but it is not within the scope of this biography to follow this discussion, or to criticise further a work the value of which will become better apparent with the lapse of time. It is sufficient here to record as above the award of the gold medal—an undoubted testimony to the great merits of the work. Another sentence from the president's address on the occasion of the award may

perhaps be added. 'In Professor Pritchard we observe an astronomer whose opportunities for stated observatory work only commenced at a time of life when most of us naturally feel a desire to be relieved from all active research, establishing under difficulties a first-class observatory, which has already attained a reputation for sound original work, of which many older establishments might well be proud—a reputation that, doubtless, will be retained at least so long as the University observatory remains under the personal control of our esteemed colleague.'

From the many letters of congratulation which the veteran astronomer received when the award became known, the following two may be selected as specially worthy of record, if only because of the personalities of the writers.

'OXFORD,
' *January 12th*, 1886.

'DEAR PROFESSOR PRITCHARD,—I write to thank you for your letter and enclosure, which give me much pleasure. I heartily sympathise with your feelings on this occasion.

'I wish you many years of happy and useful work.

'Will you send notice to the *Gazette*, if you think it fit to do so, in my name, "The Vice-Chancellor is informed that the council R.A.S.," etc., etc.—I remain, yours very sincerely,

'B. JOWETT.'

'OBSERVATORY, CAMBRIDGE,
' *9th February* 1886.

'DEAR PROFESSOR PRITCHARD,—As I find that I shall not be able to attend the anniversary meeting on Friday, and consequently shall not have the pleasure of seeing you receive the medal which you have so well deserved, and of offering you my congratulations in person, I just write a

line to show my goodwill and to express my hearty congratulations on your successful work. I have unfortunately been laid up lately with an attack of bronchitis, and although I am now well again, I am obliged to be careful in this severe weather not to expose myself to cold, and I should have to return either at night or early next morning, as I have to lecture on Saturday morning.—Believe me to remain, yours very truly,

J. C. ADAMS.

‘P.S.—Please give our kind regards and congratulations to Mrs Pritchard.’

The photometric work was no sooner completed than another undertaking, equally laborious, important and novel, was commended, viz., a systematic determination of the parallaxes of the brighter stars by photography. The parallax of a star is the inverse of its distance, and is thus large for stars near us, and small for those far away. The majority of stars are so remote that their parallaxes are too small for discernment with our present optical appliances. There are only very few stars—a few hundreds at most, probably—among the many millions which the telescope can count, which have a sensible parallax, that is to say, which sensibly change their apparent position as the earth moves round the sun in its annual orbit. It is this annual motion of the earth which enables us to measure the parallaxes of the stars, and thus infer their distance; for at times of the year, separated by six months, the positions of the earth are separated by nearly 200 millions of miles. That the stars present the same general aspect from two stations so widely separated shows at once how remote they must be; but it is not until we make measures with the greatest nicety of which modern instruments are capable, that the full truth is realised. It is then found that, not only is the aspect *generally* the

same, but so *exactly* the same that only in a very few cases can any change be detected. It is found, as above stated, that there are a few hundred stars at most which slightly change their apparent position in response to the real change of position of the earth in six months. The vast majority must either be rigidly attached to the earth's centre (a supposition which it is no longer necessary to consider), or at least 200 billions of miles away; for, if nearer, they would apparently shift their positions every six months by an amount which our telescopes could measure. The few exceptional stars whose parallaxes *are* measureable are not always found among the brighter stars, as would naturally be the case if the stars were bodies of uniform size and structure. We infer, therefore, that their size and structure varies within wide limits, and that we may yet find examples among the fainter stars, which have not hitherto attracted attention, of sensible parallax. But, other things being equal, the brighter stars should be nearer us than the fainter; and in undertaking a systematic series of measurements for parallax, Pritchard selected the brighter stars as more likely to give measureable parallaxes. The novelty of his work consisted in the employment of the photographic method. The most successful determinations of parallax up to that time had depended on eye observations with the heliometer, and work of great beauty and accuracy had been accomplished with this instrument by Bessel, Krüger, Winnecke, Auwers, Gill, Elkin and others. But the heliometer is an expensive instrument, costing some thousands of pounds. Could this great expense be obviated? By taking a photograph of the portion of sky to be examined (*viz.*, the star whose parallax is to be determined and neighbouring stars), measurements can be made in the study with a microscope instead of on the sky itself with a heliometer. Are these measurements equally valuable for the particular

purpose in view? We have seen how Pritchard proved to his own satisfaction, in the case of the lunar photographs, that 'the accuracy of the photographic method is established on a secure basis' (p. 284); but when we come to stellar parallax we are dealing with very small quantities indeed, and it is not quite certain, or at least Pritchard did not consider it 'well enough established, that for these very small quantities photographs might replace the original sky. Accordingly he set to work, in the first place, to settle this question by direct experiment. Taking the well-known star 61 Cygni, the parallax of which had been already determined many times and by many different observers, he sought its parallax by the measurement of photographic plates, and to his great delight obtained results in thoroughly good accordance with those of others and of similar 'probable error.' I quote verbatim from the report presented to the Board of Visitors on June 8, 1887.

'The somewhat hazardous enterprise of attempting, for the first time in the history of astronomy, to obtain the distance of the fixed stars from our earth by the aid of photography has been attended with success. The final results of the investigation have been placed in my hands only during the writing of this report. The first observation was obtained on May 26 of last year, and the last was effected on May 31 of the present year. The intermediate computations were systematically continued during the interval. They involved the reduction of no less than 30,000 bisections of star images on 330 photographic plates procured on eighty-nine nights. Eight independent determinations of the parallax of the two components of 61 Cygni resulted from all this work, and these happily indicate a substantial agreement between themselves, and afford other necessary proof of reliability.

'By a happy coincidence, on the very day when the final

results of these investigations were evolved, I had the pleasure of a visit from her Majesty's astronomer at the Cape of Good Hope, a practical observer whose experience in parallaxic investigations is probably unrivalled. His remarks, after critical examination of the entire work, have encouraged and gratified me. Astronomical photography is hereby placed on a secure basis as an efficient and exact exponent of the highest form of astronomical science.'

I may be laying too severe a stress upon a particular point, but I have quoted the above paragraphs for a definite reason. We again see how Pritchard, when embarking on a new enterprise, was not content to satisfy himself by direct experiment, but was anxious for the opinion and advice of the best-known experts in the matter. As at the outset of the wedge photometry he consulted Dr Huggins and others, so here he lays emphasis upon the opinion of Dr Gill, who was fresh from recent triumphs in the domain of stellar parallax with the heliometer. If Dr Gill's visit was a 'coincidence,' it was certainly one of those 'happy coincidences' which successful men have the knack of controlling.

The value of the method being established, a systematic examination of the parallaxes of second-magnitude stars was undertaken. The results are contained in Volumes iii. and iv. of the Oxford University Observatory publications, which were printed by the Clarendon Press in 1889 and 1892 respectively. The parallaxes of twenty-nine stars were determined, some of them more than once. Pritchard delighted in rounding off an investigation and giving it an aspect of completeness; and he gives in these volumes not only a full account of the Oxford work, but a complete history of the subject of stellar parallax, and a complete summary of all determinations published up to date. From this it appears that there are only ninety-one stars of which

the parallax has been measured with any care. Of these, less than half have a parallax greater than $0''.10$, that is to say, are nearer us than 200 billions of miles (approximately). These figures will serve to illustrate the remarks made above as to the total number of stars with sensible parallax. We cannot with confidence assign any limit to this number, because so few stars have been yet examined. It may seem strange to those not previously cognisant of these matters that more work has not been done in this most interesting direction; but it must be remembered that the determination of the parallax of even a single star is an immense labour. More than that, before the applicability of the photographic method was established, it involved the purchase of a very costly instrument, the heliometer. By showing for the first time that parallaxes might be determined photographically, Pritchard materially lessened both the labour and cost of such work; and, moreover, contributed a considerable share of the total knowledge at present available to us.

I have refrained from giving here any details of the work which can so much better be studied in the published volumes above referred to. The details given in the case of the photometry are sufficiently illustrative of astronomical work for those not familiar with it, without a similar explanation in each case. But it must not be supposed that the parallax work was in any way less important than the photometric, so far as contemporaries can judge. The ultimate value of all such work must be settled in the future; but contemporary recognition of the high value of the parallax work was promptly forthcoming in the shape of a royal medal from the Royal Society. It needs no words of mine to assess the authority and importance of this recognition. The terms in which the work was spoken of on the occasion of the presentation are given elsewhere in this volume, and it can well be imagined how many congratulations and good wishes

poured in on the aged astronomer at the news of this second signal mark of distinction.

He was, however, already hard at work in 'fresh fields and pastures new.' This time he had not waited as before for the completion of one piece of work before undertaking another; but when the project for an international chart of the heavens had been mooted in 1887, although the parallax work had only recently been undertaken, and would certainly require some years' work, Pritchard could not resist the fascinations of so novel an enterprise, and eagerly joined the coalition. He was not able to be present at the first Conference in Paris, 1887, but he addressed the following letter to Admiral Mouchez, here reproduced from the volume of *Procès-Verbaux*, etc., published by the French Academy at the conclusion of the Conference.

'THE UNIVERSITY OBSERVATORY, OXFORD,
12th April, 1887.

'*A Monsieur le Contre-Amiral Mouchez, Directeur de
l'Observatoire National à Paris.*

'MONSIEUR L'AMIRAL,—C'est avec le plus profond regret que je vous annonce que je ne puis pas, à cause de circonstances imprévues, assister à votre Congrès à Paris.

'1°. Si j'avais été présent, j'aurais fait remarquer l'utilité de prendre encore des renseignements définitifs sur la forme de l'instrument qui produira avec la plus grande exactitude la forme circulaire des impressions stellaires sur les clichés photographiques et aussi pour assurer la plus grande immunité de distorsion dans la distribution des images.

'J'ai moi-même photographié un champ de 81' de rayon angulaire, où toutes les impressions stellaires sont sensiblement circulaires; ceci est, je crois, la plus grande étendue de champ comme exactitude qui ait jamais été produite jusqu'à présent; j'ai soumis ce négatif au jugement de quelques-uns

des membres anglais du Congrès et ils peuvent en parler, ainsi que de l'exécution du cliché; l'instrument employé est bien connu: c'est un télescope-réfecteur de 13 pouces d'ouverture et de 120 pouces de foyer. Maintenant je m'occupe d'expériences avec d'autres ouvertures et foyers, dans le but d'obtenir la plus grande étendue de champ pour laquelle toutes les étoiles paraîtront rondes et non ovales.

'2°. Je crains que l'essai de photographier les étoiles d'une faiblesse qui excède la 16^e grandeur ne soit un projet un peu trop ambitieux pour le moment, et, vu la longue durée de l'exposition nécessaire à ce but, il se présentera d'énormes difficultés.

'J' imagine que, pour passer de la 15^e à la 16^e grandeur, la durée de l'exposition nécessaire sera au moins aussi longue que celle employée pour obtenir jusqu'à la 15^e; il y a d'autres difficultés dont il est superflu de parler à MM. les membres du Congrès.

'J'ose suggérer que bien des difficultés pratiques seront évitées en limitant le projet à la 15^e grandeur de l'échelle Pogson, si même cette grandeur peut être fixée. Un tel projet restreindra, je suppose, les reproductions imprimées permanentes destinées à la distribution, jusqu'à la 14^e grandeur approximative. En même temps, il sera peut-être désirable de prendre des images de plusieurs parties du Ciel d'après les méthodes des deux Herschel, nommées en Anglais *gauges* ou échantillons, et ces images pourront donner la reproduction d'étoiles plus faibles.

'Je crois que quatre années peuvent être suffisantes pour développer ce plan, qui est plus modeste, mais néanmoins très vaste et utile; dans l'intervalle, l'expérience et des moyens plus efficaces et plus forts peuvent être acquis pour une entreprise de plus grande importance.

'De mon côté, si je puis faire quelque chose pour avancer le projet qui sera adopté à Paris par le Congrès, je mettrai

avec plaisir les ressources de l'observatoire de l'Université d'Oxford à sa disposition.

‘J’ai l’honneur d’être, Monsieur l’Amiral, votre très humble et très dévoué serviteur,

‘CHARLES PRITCHARD, F.R.S.,
‘Director of the University Observatory, Oxford.’

The Conference was attended by fifty-six astronomers of different nationalities, who determined to make a complete map or chart of the sky, as it appears to us at the end of the nineteenth century, by photographic means. To explain the magnitude of the undertaking, it must be remarked that to be of sufficient astronomical value one photograph cannot cover more than a very small portion of sky. The images of stars near the centre of a plate are round; but further from the centre they become elliptical; and further still their shape is very irregular. By properly constructing the photographic telescope the available ‘field’ (*i.e.*, that portion of the plate of which the images are sufficiently round) can be enlarged within certain limits, but these limits no efforts have yet been able to surpass. It will be seen from the above letter that Professor Pritchard was devoting his attention to this point.

The available field of one photograph is about two degrees square or four square degrees; and as there are about 42,000 square degrees in the whole sky, some 10,000 or 11,000 photographs at least are required to cover it all over, without allowing for any overlap. To take all these photographs properly would occupy a single observatory for many years; and hence the necessity for co-operation if the work was to be accomplished within a limited time. Ultimately seventeen observatories have united their forces for the work, and a special portion of the sky has been assigned to each. It was decided at the Conference in 1887 that the co-operating observatories should all use telescopes of the same pattern, so

that the photographs might all be comparable ; and minute directions, all with the view of securing uniformity and homogeneity in the work, have been given to the different observatories by the Central Committee at different times.

The decision as to a standard pattern of instrument for the work was at first rather a blow to Professor Pritchard, for such an instrument did not exist at Oxford, and would have to be constructed if he were to take any part in the work.

In the letter to Admiral Mouchez he refers to a photograph* he had taken with the reflector which he already possessed, and he probably hoped that this instrument might be available for the work proposed. It was decided at the Conference, however, to work with refracting telescopes, and these hopes were thus disappointed.

But the generosity of Dr Warren De la Rue again solved

* The following letter from the Astronomer-Royal, referring to this photograph, is of interest :—

‘ ROYAL OBSERVATORY, GREENWICH,
‘ 1887, *March 25th.*

‘ MY DEAR PRITCHARD,—Huggins has sent me your beautiful photo of Perseus cluster, on which I heartily congratulate you.

‘ It compares favourably with Henry’s negative of the same cluster which Gill has left with me.

‘ Your stars are round up to the edge of the plate, whilst corresponding stars on Henry’s plate (70’ to 80’) from centre are decidedly oval. Also for the bright stars, the images on your plate are much smaller (in angular measure) than those on Henry’s.

‘ (This, I think, arises from the secondary spectrum with a refractor.)

‘ But Henry’s plate (32m. exposure, I believe) shows many more faint stars than the Oxford, and the smallest images near the centre of Henry’s plate are much smaller, being only 3” in diameter (including the penumbral fringe). Thus each of the two plates has its own special merits.

‘ I take it the Henrys have a great advantage in the high optical power of the directing telescope as regards keeping a star exactly on the cross-wires, their instrument having been made specially for the purpose, whilst you have had to adapt the De la Rue reflector to the work as well as you could.

‘ With congratulations on your success.—Ever yours sincerely,

‘ W. H. M. CHRISTIE.’

the difficulty. We can well imagine with what joy the following letter was received :—

‘THE ROYAL SOCIETY, BURLINGTON HOUSE,
‘LONDON, W., *June 16th*, 1887.

‘MY DEAR PRITCHARD,—It gave me very great pleasure to learn that the visitors of the Oxford University Observatory, recognising the value of your photo-astronomical work, are about to request the University to vote for five years the sum of £600 per annum to enable you to continue the work.

‘I am myself deeply sensible of the value of your work, and, provided the University will accept my offer, I will present to it, in your honour, the sum of £500, to enable it to procure the conversion of the Grubb telescope into an astronomical photographic of the very highest order.

‘A cheque will immediately follow the acceptance of this offer.—Yours sincerely, WARREN DE LA RUE.’

The offer was ultimately accepted by the Convocation on November 1, 1887. On Wednesday, November 2, Dr De la Rue enclosed a cheque to the Vice-Chancellor for £600, after having seen Sir H. Grubb’s estimate for the new photographic telescope for £575. He wrote that the £25 might go for any incidental expenses, and added that he wished an inscription to be affixed to the telescope to the effect —‘The gift of Warren De la Rue in honour of Professor Pritchard.’

Dr De la Rue died on April 19, 1889, at the age of seventy-four, from an attack of pneumonia. It would be difficult to over-estimate the value of his help—so generous and so well timed. On at least two occasions his liberality made all the difference. In 1874 it converted a refracting telescope into a well-equipped observatory; and in 1887 it

enabled that observatory to retain its place among those engaged in the very newest and most important work, when it otherwise might have had to fall behind. It is not easy to lay out money to the best advantage, even in science ; and the same amount might easily have been practically wasted. De la Rue's judgment in selecting opportunities commands our admiration quite as much, if not more, than the liberality itself.

No time was lost in giving the order for the telescope to Sir Howard Grubb, but the construction was no easy matter. The pattern selected at the Conference was a refractor of the same dimensions as the instrument which had been constructed by the brothers Henry, of Paris, who had shown what beautiful photographs could be obtained with it. Similar instruments were at once ordered from the brothers Henry by some of the observatories, more especially and naturally those on French soil, but for obvious reasons the British observatories preferred a British maker, and Sir Howard Grubb was unanimously chosen as that maker. He has accordingly supplied instruments to the royal observatories at Greenwich and the Cape, to the University observatory, Oxford, and to the Melbourne and Sydney and Mexican observatories. But the difficulties of construction were new to him, and he necessarily went through much experimental work. He began with objectives of small size, and the performances of these were tested at the Royal Observatory, Greenwich. Feeling his way, he advanced to larger glasses, and in testing these Professor Pritchard was indefatigable. The events of this search by trial and error for a satisfactory photographic object-glass are, however, too recent for detailed description here. Briefly, several objectives were made, sent to Oxford, photographs taken with them and examined, the defects classified, the objectives returned to Sir H. Grubb for correction, corrected by him accordingly, returned to Oxford and tried again, and so on. A constant interchange of letters with

the Astronomer-Royal, who was similarly testing object-glasses of smaller size, was kept up throughout this period. Such work could only proceed slowly and carefully, and took much time. In the hope of accelerating it, Professor Pritchard in October 1889 sent over his second assistant, Mr Jenkins, to stay a month in Dublin, and there to take photographs with the objectives on the spot, and so save the journeys to and fro between each trial. It will be remembered that this work was proceeding contemporaneously with the heavy work on stellar parallax, and the resources of the observatory were strained to the utmost. A fairly satisfactory object-glass was received in December 1889, but its focal length was not sufficiently accurate, and it was not until July 1890 that the instrument was finally ready.

The experimental work was, however, by no means over. The next two years were spent in experiments of all kinds, and it was not until 1892 that actual work on the chart of the heavens commenced. This work was in full swing before Professor Pritchard's death in May 1893, 255 plates having been taken; and on coming to the observatory I did not find it necessary to change in any essential point the routine of work which he had started and got into regular going order.

In September 1889, two and a half years after the General Conference of 1887, the Central Committee met in Paris to consider details. It was by that time known what observatories were to take part in the work, and many of them were already provided with instruments. Oxford was, unfortunately, as we have seen, an exception; and Professor Pritchard wrote that he had learnt, by long experience, that the actual performance of a new instrument was a much better guide than theories as to its use, and he would therefore not trouble the Committee with any remarks on this occasion. In March 1891, the Committee again met, and now Pritchard had been in possession of his object-glass for some months.

He was unable to attend the meeting in person, but sent his first assistant, Mr Plummer, to represent him ; and, further contributed an admirable summary of the experimental work which he had done. The summary deals with seven points.

1. The time of exposure necessary to obtain star images susceptible of measurement, and not liable to escape notice on the negative.

He considers that, on a good night, a ninth-magnitude star would be photographed in 20 sec. ; on an ordinary night in 55 sec. ; a fourteenth-magnitude star in 45 min. on a good night ; 80 min. on an average night.

2. Impression of eleventh and fourteenth-magnitude stars, so as to be clearly visible.

3. Increase of diameter of stellar images, with time of exposure.

4. Measurements of images near the edge of the field.

5. The method of determining photographic magnitudes at Oxford.

6. Extent of the field susceptible of exact measures.

7. The plate-carrier.

The mention of Mr Plummer's name reminds me that far too little has been said of his indefatigable and excellent work as assistant. Professor Pritchard's great age precluded his taking any share in the active work of the observatory, as a younger director might possibly have done ; and thus the whole of this work was carried on by the assistants. Further, the Professor was often absent for considerable periods owing to ill-health, and the actual initiative then fell, in many instances, to Mr Plummer. That he should go to Paris as the representative of Professor Pritchard was a fitting tribute to the position he had made for himself by great zeal and skill. The Astronomer-Royal wrote to Professor Pritchard, expressing his great satisfaction at the arrangement ; and the Central Committee paid Mr Plummer

the further compliment of putting him on a sub-committee appointed to examine and report upon the photographic specimens contributed by the various observatories. Professor Pritchard was himself a member of another sub-committee appointed to consider the best means of carrying on the adopted scale of stellar magnitudes to the fainter stars, to which it had not yet been accurately applied. The matter is somewhat technical. The proposal adopted involved the use of wire gauze screens, placed before the object-glass, to intercept a portion of the light. These were ultimately found unsatisfactory, and rejected by a large majority of the Committee; but not before a considerable amount of experimental work had been done. Especially heavy work was undertaken at Oxford, where an alternative method, based on previous experience with the wedge photometer, was worked out at the cost of considerable labour, and found satisfactory.

The amount of work of this and other kinds got through at Oxford during these, the last, years of Pritchard's life, is plainly visible from the heavy correspondence preserved in the observatory. I have read through these letters, hoping to find some to reproduce; but the selection is particularly difficult. Many of the writers are still alive (the Astronomer-Royal, Dr Gill, Dr Huggins, Dr Roberts), and their letters are so often of that friendly and semi-private character which precludes reproduction. Others, again, such as those to the late Admiral Mouchez, are too much concerned with the technical details of the work for the astrographic chart.

From Professor Pritchard's own letters of about this time, I select the following example:—

' 30th October 1890.

'DEAR ADMIRAL MOUCHEZ,—The instrumental equipment for the international chart is, I rejoice to say, now apparently complete, and I feel that at this observatory

we are at last *launched, i.e.,* launched for *groping to know* our instrument and *how to use it.*

‘After all my many years’ experience, I feel that our knowledge is very dark upon the very wide questions of celestial photography on which we are all embarked. To me one important conclusion is very apparent, viz., that the Congress will be wise not at present to lay down rules of the Medes and Persians; also that very much already apparently determined by the Congress had better be regarded at the next meeting thereof as subject to a revision. The experience of the members of the Congress in the nature and use of the new instrument is as *yet necessarily very limited*, and for my own part I hardly know yet what may turn out to be the case. I am diligently groping and inquiring.

‘Happily I conclude that the instruments and reticule are a great success, and that the scheme of the Congress is *practicable*, provided only that we do not in the first instance require too much—*i.e.,* too wide a field in respect of the faintness of the stars to be photographed. I think that our efforts would in the first instance be wisely confined to the limits of mag. 11. We should thereby gain experience and knowledge.

‘The question of the plates to be used, I now practically find, is a very important one, and of some difficulty. I do not find in your last fasciculus that Dr Eder has yet helped us by reporting his experience. It occurs to me that some arrangement should be made with some *commercial firm* to supply us with plates having a *given emulsion*, to be selected by competent authority.

‘The question of the glass is also important—the expense thereof may be serious—and I yet await the reply of the glass manufacturers whom you mention in your fasciculus. I believe I have devised a very rapid method of measuring the photo. mags., and also another for an

exact and rapid method for copying the photod. plates, of which more by-and-by.—I am, dear Admiral, yours truly,
C. PRITCHARD.'

The end of my journey should be within sight, but I look back with dismay on the poverty of the ill-kept log. It is one thing to be a traveller and see things of interest, quite another to give an account of them which will convey a tithe of that interest to others. Would that this story of Professor Pritchard's astronomical work could have been so complete and workmanlike as his own memoirs! As it is, perhaps these straggling notes, though lacking in symmetry, may here and there catch the attention of those patient enough to turn over the leaves.

There is some abruptness in this termination; but an abruptness perhaps not altogether unfitting the subject. In some ways Professor Pritchard's death was foreshadowed—his physical health could not but suffer with advancing years. He lost his 'right hand,' Mr Plummer, who was appointed Director of the Liverpool Observatory in 1892, and he did not fill his place at the observatory. Mr F. A. Bellamy was appointed assistant, but neither Mr Jenkins nor he was advanced into the vacant position, and Professor Pritchard frankly assigned as a reason that he wished to leave his successor unembarrassed in the choice of a first assistant. But though the signs of failing health were thus apparent, not only to others but to himself, there was no corresponding decadence in the work, which was carried on to the very last; and, even after that, continued on the same lines by virtue of the momentum imparted to it. As I am dealing here not with the whole of Professor Pritchard's personality and life, but with his astronomical work only, a certain abruptness in terminating my task is thus almost inevit-

able, and I therefore not ungratefully accept the situation. At this point, the Oxford University Observatory having been built, and made thoroughly efficient; the *Uranometria Nova Oxoniensis* having been published; the parallaxes of the second-magnitude stars having been determined; and the Oxford share of the astrographic chart having been successfully incepted—at this point the masterhand was withdrawn from the work.

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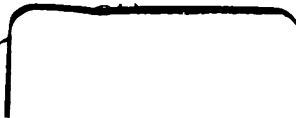
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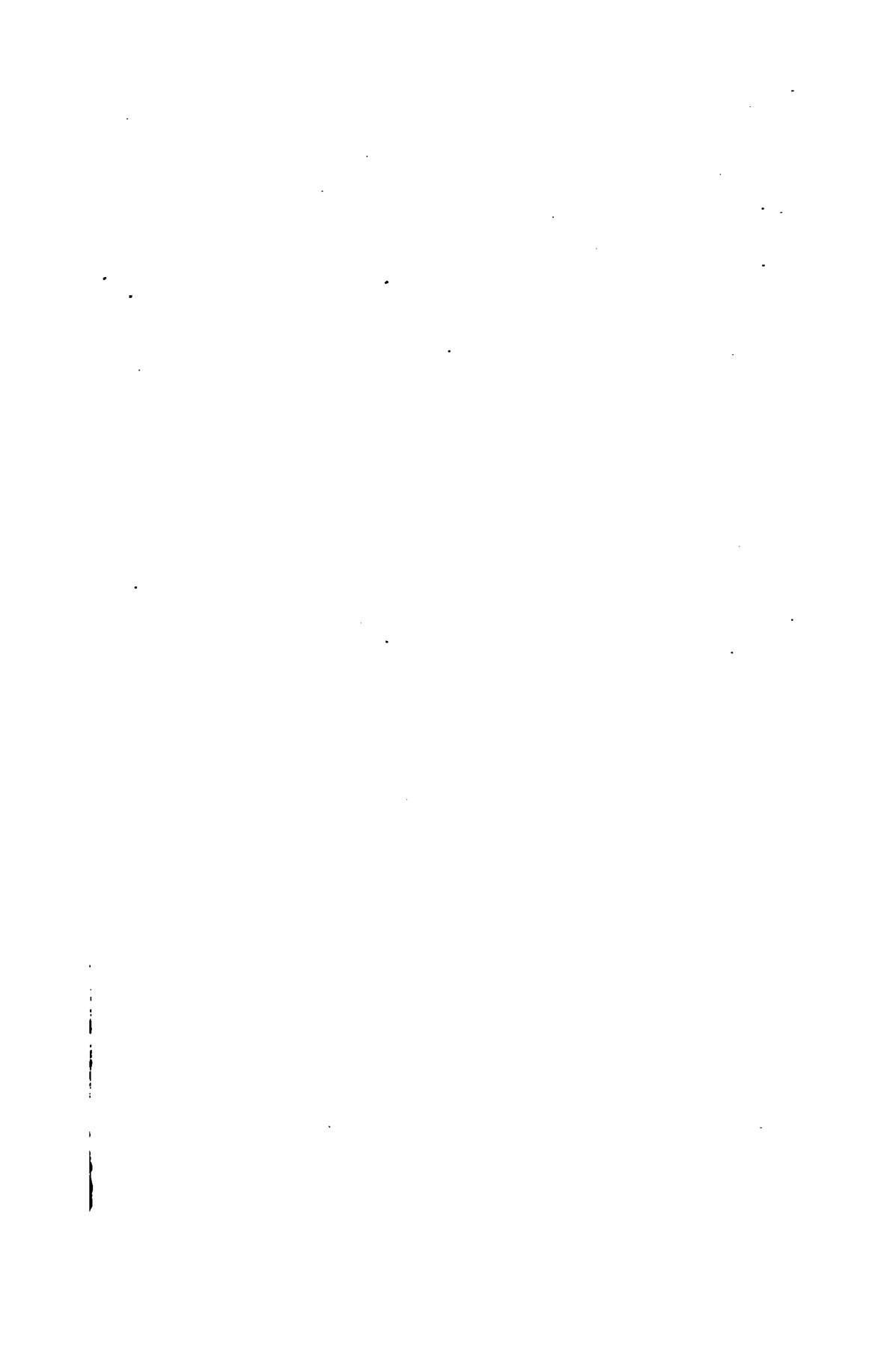
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